Volume 8 WINTER No. 1

JOURNAL of GERONTOLOGY

To add life to years, not just years to life

UNIV. OF MICHIGAN
FEB 3 1953
MEDICAL LIBRARY

JANUARY 1953

GEOGRAPHIC AND HISTORICAL PATHOLOGY OF ARTERIOSCLEROSIS
F. Henschen

EFFECTS OF CASTRATION AND THE PROCESSES OF AGING IN MALE RATS AND MAN
V. Korenchevsky, S. K. Paris, and B. Benjamin

LONG RANGE SEX STEROID REPLACEMENT - TARGET ORGAN REGENERATION
W. H. Masters

NORMAL PRECORDIAL ELECTROCARDIOGRAM IN THE AGED
O. Olbrich and E. Woodford-Williams

EFFECT OF CHANGE OF BODY POSITION ON THE PRECORDIAL ELECTROCARDIOGRAM IN YOUNG AND OLD SUBJECTS
O. Olbrich and E. Woodford-Williams

POTASSIUM CONTENT OF PLASMA AND RED CELLS IN VARIOUS AGE GROUPS
A. Videbaek and P. G. Ackermann

THYROTOXICOSIS IN AGED INDIVIDUALS
K. Iversen

PRESENT-DAY SURGICAL VIEWPOINTS AND PROCEDURES IN VASCULAR SURGERY OF THE AGED. A Review
R. A. Nabatoff

WECHSLER-BELLEVUE PERFORMANCE OF WHITE MALES PAST AGE 50
B. Berkowitz

RETIREMENT AND THE PROFESSIONAL WORKER
R. Havighurst and E. Shanas

A COMMUNITY PLANS A RECREATION PROGRAM FOR THE AGED
H. G. Laue

GERIATRIC NURSING PROGRAMS IN SCHOOLS OF NURSING
B. C. André

REPORT OF THE FIFTH ANNUAL SCIENTIFIC MEETING OF THE GERONTOLOGICAL SOCIETY, INC.
I. Ladimer

Published Quarterly by
THE GERONTOLOGICAL SOCIETY, INC.

EDITORIAL STAFF
GERONTOLOGICAL SOCIETY, INC.

EDITORIAL BOARD

ROBERT A. MOORE, *Chairman*
ST. LOUIS

ERNEST W. BURGESS
Chicago

ROY G. HOSKINS
BOSTON

PAUL D. WHITE
BOSTON

EDITORS

JOHN ESBEN KIRK, *Editor-in-Chief*
NATHAN W. SHOCK, *Assistant Editor*
MARJORIE ADLER, *Assistant to the Editor*

FOREIGN CORRESPONDENTS

Correspondent for Argentina
B. A. HOUSSAY, Buenos Aires
Correspondent for Canada
W. S. HARTROFT, Toronto
Correspondent for Denmark
T. GEILL, Copenhagen
Correspondent for Finland
E. JALAVISTO, Helsinki
Correspondent for France
F. BOURLIÈRE, Paris
Correspondent for Great Britain
V. KORENCHEVSKY, Oxford
Correspondent for Ireland
J. F. FLEETWOOD, Dublin
Correspondent for Italy
G. MARS, Milan
Correspondent for Mexico
E. AGUIRRE PEQUEÑO, Monterrey
Correspondent for Portugal
J. DE REIS, JR., Lisbon
Correspondent for South Australia
O. W. FREWIN, Adelaide
Correspondent for Spain
F. VEGA DIAZ, Madrid
Correspondent for Sweden
E. ECKERSTRÖM, Gothenburg
Correspondent for Uruguay
J. M. SOSA, Montevideo

CONSULTANTS TO THE EDITORS

For the Natural Sciences
E. V. COWDRY, Washington University

For the Social Sciences
H. G. MOULTON, Brookings Institution

For the Humanities
RICHARD F. JONES, Stanford University

ADVISORY EDITORIAL BOARD

W. M. ALLEN, Obstetrics and Gynecology
Washington University
BERT G. ANDERSON, Dentistry
Yale University
DAVID P. BARR, Internal Medicine
Cornell University
E. M. BLUESTONE, Hospital Administration
Montefiore Hospital
D. E. CAMERON, Psychiatry
McGill University
A. J. CARLSON, Physiology
University of Chicago
F. STUART CHAPIN, Sociology
University of Minnesota
LOUIS I. DUBLIN, Biostatistics
Metropolitan Life Insurance Co.
W. H. FELDMAN, Veterinary Medicine
Mayo Foundation
J. S. FRIEDENWALD, Ophthalmology
Johns Hopkins University
A. C. FURSTENBERG, Otolaryngology
University of Michigan
WILLIAM M. GAFAFER, Biostatistics
United States Public Health Service
E. C. HAMBLEN, Endocrinology
Duke University
FRANK HANKINS, Sociology
Smith College
FRANK HINMAN, Urology
University of California
FREDERICK L. HISAW, Zoology
Harvard University
OSCAR J. KAPLAN, Psychology
San Diego State College
GEORGE LAWTON, Psychology
Consulting Psychologist, New York
FORREST E. LINDER, Statistics
Bureau of the Census
IRVING LORGE, Psychology
Teachers College, Columbia University
C. M. MCCAY, Nutrition
Cornell University
WILLIAM MUHLBERG, Insurance Medicine
Union Central Life Insurance Co.
WINFRED OVERHOLSER, Psychiatry
St. Elizabeths Hospital
OLLIE RANDALL, Social Work
Community Service Society of New York
R. REDFIELD, Anthropology
University of Chicago
PEYTON ROUS, Oncology
Rockefeller Institute for Medical Research
HENRY SIMMS, Biochemistry
Columbia University
OWEN H. WANGENSTEEN, Surgery
University of Minnesota
ARNOLD WELCH, Pharmacology
Western Reserve University
PAUL D. WHITE, Cardiology
Massachusetts General Hospital
W. R. WILLIAMSON, Actuarial Science
Wyatt Company, Washington, D. C.

VOLUME

GEOGRAP
EFFECTS
...
LONG RA
..
THE NO
..
THE EF
IN
THE PO
...
THYROTO
PRESENT
AG
THE WE
...
RETIREM
...
A COMM
GERIATR
REPORT
CIE
CURRENT
ORGANIZ
BY
PR

BOOKS . .
INDEX TO

VOLUME 8 *January · 1953* NUMBER 1

JOURNAL OF GERONTOLOGY

Contents

PAGE

GEOGRAPHIC AND HISTORICAL PATHOLOGY OF ARTERIOSCLEROSIS .... *Folke Henschen* 1

EFFECTS OF CASTRATION AND THE PROCESSES OF AGING IN MALE RATS AND MAN ..... *V. Korenchevsky, Sheila K. Paris, and B. Benjamin* 6

LONG RANGE SEX STEROID REPLACEMENT - TARGET ORGAN REGENERATION ..... *William H. Masters* 33

THE NORMAL PRECORDIAL ELECTROCARDIOGRAM IN THE AGED ..... *O. Olbrich and E. Woodford-Williams* 40

THE EFFECT OF CHANGE OF BODY POSITION ON THE PRECORDIAL ELECTROCARDIOGRAM IN YOUNG AND AGED SUBJECTS ..... *O. Olbrich and E. Woodford-Williams* 56

THE POTASSIUM CONTENT OF PLASMA AND RED CELLS IN VARIOUS AGE GROUPS .... *Aage Videbæk and P. G. Ackermann* 63

THYROTOXICOSIS IN AGED INDIVIDUALS ..... *Kurt Iversen* 65

PRESENT-DAY SURGICAL VIEWPOINTS AND PROCEDURES IN VASCULAR SURGERY OF THE AGED. A REVIEW ..... *Robert A. Nabatoff* 70

THE WECHSLER-BELLEVUE PERFORMANCE OF WHITE MALES PAST AGE 50 ..... *Bernard Berkowitz* 76

RETIREMENT AND THE PROFESSIONAL WORKER ..... *Robert J. Havighurst and Ethel Shanas* 81

A COMMUNITY PLANS A RECREATIONAL PROGRAM FOR THE AGED ..... *Helen G. Laue* 86

GERIATRIC NURSING PROGRAMS IN SCHOOLS OF NURSING ..... *Beverly C. André* 90

REPORT OF THE FIFTH ANNUAL SCIENTIFIC MEETING OF THE GERONTOLOGICAL SOCIETY, INC. ..... *Irving Ladimer* 94

CURRENT COMMENT 104

ORGANIZATION SECTION 106

BY-LAWS OF THE GERONTOLOGICAL SOCIETY, INC. 107

PROCEEDINGS OF THE FIRST CONFERENCE OF THE EUROPEAN DIVISION OF THE RESEARCH COMMITTEE ON BIOLOGY AND MEDICINE ..... *Edited by L. Brull, A. P. Thomson, and V. Korenchevsky* 111

BOOKS 113

INDEX TO CURRENT PERIODICAL LITERATURE 114

General Information

THE JOURNAL OF GERONTOLOGY is a quarterly magazine published at 10 N. Howard St., Baltimore 1, Maryland, and is owned and controlled by the Gerontological Society, Inc., New York, with editorial offices at 660 South Kingshighway Blvd., St. Louis 10, Missouri. It publishes original manuscripts dealing with or bearing on the problems of aging from the fields of natural and social sciences and the humanities, review articles, and selected abstracts from current literature appropriate to the subject. Preference will be given to manuscripts containing observational data.

The Gerontological Society, Inc. and the Editors accept no responsibility for the views and statements of the authors as published in their original communications.

INSTRUCTIONS TO CONTRIBUTORS

Lack of adherence to instructions may result in delay of publication.

1. Manuscripts should be addressed to the editorial offices, 660 South Kingshighway Blvd., St. Louis 10, Missouri.
2. Papers should rarely exceed twenty typewritten pages in length, including illustrations. They must be typewritten, double spaced, on standard-size white paper 8½" x 11".
3. A condensed title for running page headline, not to exceed forty letters and spaces should be supplied.
4. A brief biographic sketch of the author should accompany all papers.
5. Tables are costly to print and should be used only when necessary to clarity. In such cases they should be as condensed as possible and typed on a separate sheet. Tabular matter in excess of 10 per cent of the cost of composition and printing of the manuscript is to be at the expense of the author.
6. Typed legends including the author's name should be clipped to each illustration. Each plate must be arranged by the author. Engraving charges in excess of 10 per cent of the cost of composition and printing of the manuscript are to be at the expense of the author. If illustrations are larger than manuscript sheet size, small prints, as well as the original drawings, should be submitted with the manuscript to facilitate mailing to reviewers. The reduction of figures desired should be clearly indicated on the margin of the drawing. Drawings should be in India ink on white paper and if background lines are used they should be blue. All lettering should be large enough to give 2 mm. letters in the final Journal reduction. Maximum plate size is 5¼" x 8" (if legends are to be included on the same page the length should be correspondingly less). Final single column plate width is 2¾".
7. Authors are requested to limit the use of footnotes.
8. Every paper should end with a brief summary in which the points established by the investigation are outlined.
9. References to periodical literature must be arranged alphabetically and given in order: name of author, title of article, name of periodical (abbreviated as in Fishbein, *Medical Writing*), volume number, inclusive pagination, and year. For books: name of author, title of book, publisher, city, and year. Example, for periodical literature: Gofman, J. W., Lindgren, F. T., Jones, H. B., Lyon, T. P., and Strisower, B.: Lipoproteins and Atherosclerosis. *J. Gerontol., 6:* 105-119, 1951. For books: Monroe, R. T.: *Diseases in Old Age.* Harvard University Press, Cambridge, 1951.
10. Articles may be submitted to the Journal in a foreign language but if accepted must be translated at the responsibility and expense of the author.
11. Submission of a paper to this Journal is held to imply that it has not been published and is not to be published elsewhere (except as Society Proceedings) without permission from the JOURNAL OF GERONTOLOGY.

Subscription prices a year beginning with volume 8, 1953: In the United States, Canada, Mexico, Cuba, Central and South America, the JOURNAL OF GERONTOLOGY is $10.00; in other countries the Journal is $10.50 (the equivalent of $10.50 U. S. currency on the day of transfer). Single copies of the Journal are available at $2.50. Back issues, 1946-1949, are $6.00 a volume; 1950-1952 issues are $8.00 a volume, plus 50¢ postage to foreign countries. Checks should be made payable to the JOURNAL OF GERONTOLOGY. New subscriptions and renewals are entered to begin with the first issue of the current volume. Four weeks' notice is required for change of address.

All communications and remittances relating to subscriptions, back volumes, advertising, and remittances for reprints, etc., may be directed to 10 North Howard St., Baltimore (1), Maryland, or to the office of publication, 660 South Kingshighway Blvd., St. Louis 10, Missouri.

Entered as second class matter at the postoffice of Baltimore, Maryland.

Copyright, 1953, Gerontological Society, Inc. All rights in the JOURNAL OF GERONTOLOGY are reserved. No part may be reproduced in any form whatsoever without permission in writing from the Journal, except by a reviewer who wishes to quote brief passages in connection with a critical review. Reproduction in whole or in part in digests, in condensations of the literature, in lectures, or in films, or by any other processes or devices is reserved by the Journal.

In early Rheumatoid arthritis

to increase and accelerate the appearance of remissions

"Gold salts, if administered during the first year of rheumatoid arthritis, increase and accelerate the appearance of remissions."* A remission rate of 66 per cent was recently noted in a group of gold-treated patients with rheumatoid arthritis of 12 months or less duration. Similar patients treated without gold showed a remission rate of only 24.1 per cent. On the average, remissions appeared 10 months sooner in the gold-treated cases.

SOLGANAL®
(aurothioglucose)

*Adams, C. H., and Cecil, R. L.: Ann. Int. Med. 33:163, 1950.

Schering CORPORATION • BLOOMFIELD, N. J.

SOLGANAL

SCHERING

JOURNAL OF GERONTOLOGY

J. E. KIRK, *Editor*

N. W. SHOCK, *Assistant Editor*

Volume 8 **JANUARY 1953** **Number 1**

PUBLISHED QUARTERLY BY THE GERONTOLOGICAL SOCIETY, INC.

CONTENTS *and* CONTRIBUTORS

F. HENSCHEN, *Geographic and Historical Pathology of Arteriosclerosis*

Dr. Henschen is emeritus professor of pathology at the Caroline Institute School of Medicine, Stockholm, Sweden. After retirement he has been interested especially in gerontologic problems and in geographic pathology (reviving of the International Society of Geographical Pathology). He is now working in the Caroline Hospital, Stockholm.

The role of diet in the etiology of arteriosclerosis was studied by comparing autopsy material from three different regions in Sweden during peacetime and during the nutritional crisis attending World War II. Close collaboration between the pathologists performing the autopsies in the three regions assured comparability of the findings. The incidence of arteriosclerosis was much lower in the northern part of Sweden where the diet was poor in fat than in the middle and southern areas where the diet was richer in fat and calories. The incidence of arteriosclerosis was lower during the war years than during peacetime, particularly in the ages 30 to 60.

V. KORENCHEVSKY, S. K. PARIS, AND B. BENJAMIN, *Effects of Castration and the Process of Aging in Male Rats and Man*

Dr. Korenchevsky has been head of the Gerontological Research Unit at Oxford, England since 1945. He has served as secretary of the British Society for Research on Aging since 1939 and is also founder of the International Association of Gerontology. Miss Paris has served as research assistant in the Oxford Gerontological Research Unit since 1948. Mr. Benjamin is head of the Statistical Section of the London County Council, Public Health Department.

In male rats, castration produced some changes which were similar to changes observed in normal rats during the process of aging. Among these changes were diminished weight of many organs, hypertrophy of the cytoplasm in the cells, a decrease in the number of dividing cells, and an increased deposition of body fat. The authors suggest that the relative hypoplasia of organs with aging represents a physiologic adjustment in the aging organism in which the growth-suppressing mechanisms predominate over the growth-promoting ones. Although deficiency in sex hormones may accelerate the onset of senility, such a deficiency is not a primary cause of aging. The authors believe that in man old age is a pathologic condition complicated by various pathologic secondary features of aging.

W. H. MASTERS, *Long Range Sex Steroid Replacement - Target Organ Regeneration*

Dr. Masters is associate professor of obstetrics and gynecology, Washington University School of Medicine. During the past six years he has been associated with an evaluation of the effects of long term sex steroid replacement in the aged female.

The present study reports structural changes in the ovary, vagina, uterus, and breasts of 7 aged women who were undergoing sex hormone therapy when they died. Examination of histologic sections gave evidence of a return of function in vagina, uterus, and breast, with no effect on the ovary. Blood vessel reactivation was observed in the uterus and ovary, but there was no significant change in the blood vessels of the vagina or breast.

O. OLBRICH AND E. WOODFORD-WILLIAMS, *The Normal Precordial Electrocardiogram in the Aged*

Dr. Olbrich, a fellow of the Royal College of Physicians, Edinburgh, is consultant physician in charge of Geriatric Services of the Sunderland Group of Hospitals in England. Dr. Woodford-Williams,

member of the Royal College of Physicians, London, is assistant physician to the Geriatric Services of the Sunderland Group of Hospitals.

A detailed analysis of electrocardiograms recorded from 13 leads (3 standard leads, 3 unipolar limb leads, and 7 precordial leads from V1 to V7) in 500 patients over the age of 60 years is presented. Among the 500 patients, 154 were found whose tracings complied with the accepted normal patterns of young adults. The aged showed a depression of the RS-T junction and segment and alterations in the shape and amplitude of the T waves which may be ascribed to vascular changes affecting the heart. Changes in the Q wave in precordial lead V3 are explained by changes in position of the heart in the aged. Heart rate did not change with advancing age.

O. Olbrich and E. Woodford-Williams, *The Effect of Changes of Body Position on the Precordial Electrocardiogram in Young and Aged Subjects*

The authors have demonstrated that older subjects are much more susceptible to voltage changes produced in the electrocardiogram by changes in body position than are young subjects. The smaller deflections (voltage changes) found in older subjects are probably due to anatomic changes in the position of the heart in the chest rather than to decreases in the action current of the heart.

A. Videræk and P. G. Ackermann, *The Potassium Content of Plasma and Red Cells in Various Age Groups*

Dr. Videbæk is authorized as a specialist in internal medicine in Denmark and Dr. Ackermann is research assistant, Division of Gerontology, Washington University School of Medicine, St. Louis, Missouri.

The investigation includes 47 individuals between 25 and 97 years of age. Using the flamephotometric procedeure potassium analyses were performed on whole blood and on plasma. The hematocrit values served for calculation of the potassium content of the erythrocytes. The plasma potassium values showed a slight but not significant increase with age. No effect of age on the potassium content of the red cells was found.

K. Iversen, *Thyrotoxicosis in Aged Individuals*

Dr. Iversen is resident physician in the Kommunehospital, Dept. II, Copenhagen, Denmark.

An analysis of all cases of thyrotoxicosis admitted to the hospitals in the City of Copenhagen during the period 1938 to 1945 was made. Of the 1832 patients, 9.8 per cent were over 60 years of age. In this group there were 137 females but only 12 males. The symptoms of the disease were different in the patients over 60 years of age. Exophthalmus and other eye symptoms were absent in the patients over 60, whereas auricular fibrillation and cardiac insufficiency occurred in 25.5 and 22.0 per cent of the older patients as compared with 2.0 and 2.6 per cent in the young group.

R. A. Nabatoff, *Present-Day Surgical Viewpoints and Procedures in Vascular Surgery of the Aged*

Dr. Nabatoff received his training in general surgery at the Mount Sinai Hospital, New York, and then was awarded a Rosenstock Foundation Fellowship in cardiovascular surgery at the Presbyterian Hospital, New York, and at Johns Hopkins Hospital, Baltimore. He is now engaged in experimental and clinical cardiovascular surgery at Mount Sinai, Presbyterian, and Harlem Hospital, and the Hospital and Home for the Aged and Infirm Hebrews, New York.

As a result of great strides in the field of cardiovascular surgery during the past decade, many conditions which have hitherto been considered hopeless have now become amenable to surgical treatment. The newer methods of diagnosis and treatment for coronary insufficiency, arterial aneurysms, arteriosclerotic occlusive peripheral vascular disease, thrombo-embolic disease, varicose veins, and the postphlebitic syndrome, are presented. Promising research now in progress is described so as to indicate future clinical developments in this field.

B. Berkowitz, *The Wechsler-Bellevue Performance of White Males Past Age 50*

Dr. Berkowitz is chief psychologist, Bath (N. Y.) Veterans Administration Center. He is also clinical associate and lecturer in the Graduate School, University of Rochester.

The Wechsler-Bellevue test of mental performance was administered to 1233 white male subjects (aged 20 to 84 years) at the Bath Veterans Center in New York State. Most of the subjects were residents of a veterans domiciliary home and 1026 of them were over 50 years of age. Average performance on some of the subtests (digit symbol, block design, and picture arrangement) decreased progressively with increasing age. Other subtests (object assembly, comprehension, digit span, and similarities) showed greater decrements in average performance between the ages of 40 and 59 than between 60 and 79 years of age. In fact, the decrement in performance between 60 and 79 years of age was often very small.

Robert J. Havighurst and Ethel Shanas, *Retirement and the Professional Worker*

For the past eight years a University of Chicago Committee on the Study of Maturity has been study-

ing the retirement experience and problems of professional workers. Professor Havighurst is chairman of this Committee and Dr. Shanas is director of research.

The authors summarize the historical development of the significance of work to people in the professions, showing that work has a variety of non-economic values to people. The values of work to people in the professions are influenced by the nature and the traditions of the professions. Generally speaking, having a profession gives a person a feeling of self-respect and a place of prestige in the society. Consequently, retirement is often a bitter experience to professional workers.

The key to satisfaction with retirement lies in finding satisfactions outside of the work life which adequately replace those that are lost when work is relinquished. There are several patterns of movement from full-time employment to full-time retirement, and these are discussed with relation to the professional worker.

H. G. Laue, *A Community Plans a Recreation Program for the Aged*

Mrs. Laue was assistant director of the Community Project for the Aged of the Welfare Council of Metropolitan Chicago from 1947 through 1950. Since that time she has been associate executive secretary of the Family and Child Welfare Division of the Welfare Council with responsibility for implementing the plan of Community Services for Older People prepared by the project.

The author has described the processes of community planning as used in one city to meet the recreational needs of older people. Recreation is defined in its broadest terms to include those activities and relationships which give meaning and value to the leisure of the individual. The needs of all older people, from the able to the homebound, and all resources of the community are considered in the planning.

Methods which are described include: Getting the facts about the needs of people and the resources to meet them; making the facts known to the community at large and to specific organizations; demonstrating abilities and interests of older people through Hobby Shows and programs; trying out new ways of meeting needs for companionship and activity; providing opportunities for education of professional staff; securing financial support; insuring continuous planning process and the involvement of individuals and organizations from many phases of community life in the planning process.

Beverly C. André, *Geriatric Nursing Programs in Schools of Nursing*

Miss André is acting director, Department of Nursing, Northwestern State College, Natchitoches, Louisiana.

A survey of 126 schools of nursing in the United States and two territories showed a growing recognition of geriatric nursing as a part of the curriculum. The selected schools represented the hospital school of nursing, the basic collegiate school of nursing, the public health program for graduate nurses, and the postgraduate program for the graduate nurse.

With few exceptions the schools considered the problem of aging and the aged; the social, emotional, mental, and physical aspects of late maturity, senescence and senility; the more common diseases among the aged group and medical research in the extension of life expectancy as basic content in any course or courses wherein geriatric nursing was taught.

The subject material was more frequently integrated into other nursing courses than taught as an independent entity.

JOURNAL OF GERONTOLOGY

VOLUME 8 JANUARY, 1953 NUMBER 1

Geographic and Historical Pathology of Arteriosclerosis

FOLKE HENSCHEN

THE object of this paper is to show that geographic and historical methods are able to throw light on the pathogenesis of arteriosclerosis.

In this disease, as in most others, there are two kinds of etiologic factors, the endogenous, genetic, or constitutional factors, and the exogenous, or milieu factors. Genetic, constitutional factors of a certain biologic entity are more or less constant, unchangeable, whether that entity may be a certain race, a stable population, or a single individual. On the other hand the operating milieu factors may vary greatly in regard to place and time, i.e., geographic dissimilarities and historical fluctuations. This may hold for almost every disease.

There are different opinions about the significance of the milieu factors in the etiology of arteriosclerosis, but I believe no one questions that geographic and historical changes may influence the incidence and degree, and perhaps also the extent and localization of arteriosclerosis, provided that such changes are of a certain duration and not too inconsiderable.

A series of investigations as to the geographic distribution of arteriosclerosis, its degree and character among different races and populations, have been carried out, but most of them are of but little scientific value, as Anitschkow (1) pointed out in his excellent report at the second conference of the International Society of Geographical Pathology at Utrecht in 1934, which was devoted solely to arteriosclerosis. There are great difficulties and many sources of error connected with such an investigation which is based entirely on autopsies. The statistics are usually too scanty, the primary data too incomplete, both anatomically and in respect to age distribution; furthermore, in primitive populations we must expect unreliable statements as to age and also a very low average age.

Geographic investigations on the influence of different milieu factors, especially nutrition, should be carried out only within stable populations of homogenous racial composition with a high average age, and then only on the basis of a sufficient number of autopsies carried out on comparable principles. As a matter of fact, very few countries will fulfill all these requirements for an objective and reliable investigation on the geography of arteriosclerosis, but one of them is Sweden.

Sweden is of great length from North to South (fig.1). The population is very homogenous in comparison with those of most other countries, and, at the time of our investigation, it was still very stable. On the other hand, the conditions of life vary very greatly: in the northern parts there are very long and cold winters, the food there was, at the time of the investigation, relatively poor in fat, mostly lacto-vegetable, sometimes rich in fish, and the population anything but fat. The southern part of Sweden has about the same

Presented at the Second International Gerontological Congress, September 9-14, 1951, St. Louis, Missouri. Published on a grant from the Forest Park Foundation.

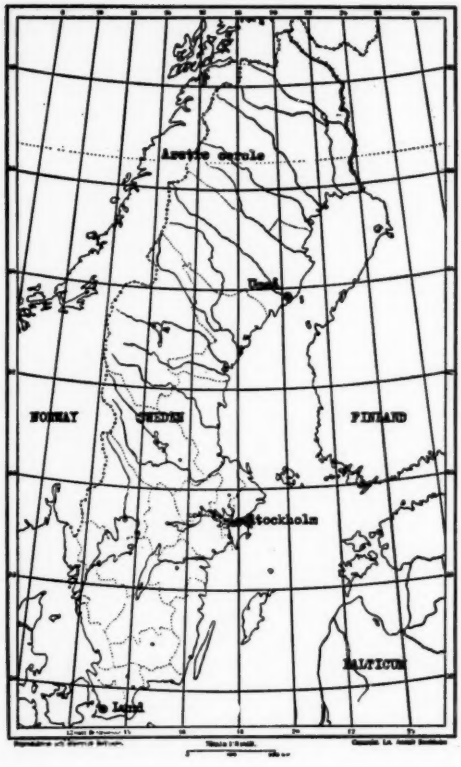


FIG. 1. Map of Sweden. The geography of arteriosclerosis was studied in three cities, Lund (South Sweden), Stockholm (Central Sweden), and Umeå (North Sweden, not very far from the Arctic Circle).

climate as that of Central Europe; the inhabitants of this part, Skåne, are mostly very well nourished and often a little fat. In Central Sweden and in Stockholm, the capital, the inhabitants live under very good conditions, and as in Skåne, the food was, at the time of the investigation, very rich in calories.

About eighteen years ago, Sjövall (4), and I organized a comparative investigation regarding the autopsy findings in arteriosclerosis in three different parts of the country, in Umeå, (North Sweden), in Stockholm, (Central Sweden), and in Lund, (South Sweden) (fig. 1). The autopsies were performed and the reports drawn up on absolutely the same principles. We were able to demonstrate distinct differences between the occurrence and grade of the disease in North Sweden (Lundquist and Björnwall, 3) on the one hand, and Central and South Sweden (Sjövall and Wihman, 4) on the other.

Figure 2 indicates the "total arteriosclerosis" of every decade, i.e., the occurrence and grade of lesion in 14 to 16 different sites of the arterial system[1] graded after the following points: no arteriosclerosis, 0; very mild arteriosclerosis, 0.5; mild arteriosclerosis, 0.1; marked arteriosclerosis, 1.5; very pronounced arteriosclerosis, 2.0; extremely intense arteriosclerosis, 2.5. The investigation includes 1481 autopsies. In the Umeå material there were no cases with 2.0 or 2.5 points; in the Stockholm and Lund material there were only 7 cases with 2.5 points.

There were also differences between prosperous Stockholm and flourishing Skåne, where arteriosclerosis reached its maximum in the last decades of life, especially among old women. This comprehensive and objective investigation clearly shows the role of the nutritional factor in the pathogenesis of arteriosclerosis. In this connection it should be mentioned that coronary sclerosis was a little more marked in the autopsy material from the city of Stockholm than in the postmortem material in Lund, derived mostly from a rich countryside.

Historical pathology may also contribute to the knowledge of the pathogenesis of arteriosclerosis. Egyptian mummies exhibit considerable arteriosclerosis. On the other hand, Peruvian mummies exhibit but slight arteriosclerosis, probably due to differences in nutrition or average age, or both. But these two instances prove but little; here too we need extensive statistical research. Variations in the nutritional conditions of a certain population or of a single individual during shorter or longer periods may be reflected in the occur-

[1] Aorta: radix, arch, thoracic, abdominal. Pulmonary Artery. Coronary Arteries: right, left descending, left circumflex. Abdominal Arteries: coeliac, splenic, superior mesenteric, inferior mesenteric. Arteries of Extremities: left subclavian, right subclavian (these two arteries included only in the Lund studies), left femoral, right femoral.

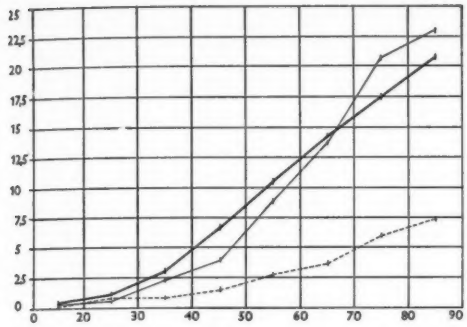


FIG. 2. Occurrence and degree of arteriosclerosis in relation to age, based on autopsies in three different parts of Sweden. Fine line—North Sweden (Umeå). Thick line—Middle Sweden (Stockholm). Dotted line—South Sweden (Lund). Abscissa—age; ordinate —degree of arteriosclerosis.

rence and degree of arteriosclerosis provided that the calory content, and especially the content of fats and cholesterol in the food, play a role in the etiology of this disease.

Here too, the Nordic countries can contribute to the discussion. These four countries, Denmark, Finland, Norway, and Sweden, had a rather serious nutritional crisis during the last war. Food supplies were rigorously regulated; fat, eggs, and meat were very scarce and the quantity of carbohydrates also insufficient. On the other hand supply of vitamins was adequate. People grew thin and complained bitterly about this, but it was no doubt very beneficial for their health, at least in Sweden; as a matter of fact, the Swedes have never in their history been so healthy as during these years of food restrictions. Mortality declined markedly, as the curve in figure 3 demonstrates.

On the whole, the curve describes a very satisfactory decline during the last twenty-five years. There is, as will be seen, a transient valley in the early thirties, probably in connection with the economic depression at that time. Then there is a sudden and deep valley during the crisis years with a consecutive overmortality in the following years and, finally, in the last two years a mortality rate of 10 per

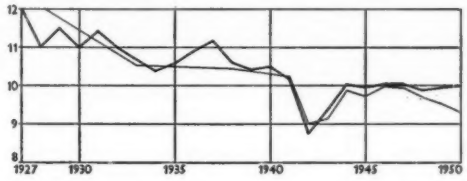


FIG. 3. Total mortality per thousand in Sweden in 1927 to 1949. Thick line—Sweden. Fine line—Stockholm.

thousand, corresponding either to a stabilization at a low value or to a new valley in connection with the present time of high prices.

The general curve of mortality shows an obvious conformity with the curves of mortality in figure 4, constructed on the basis of the

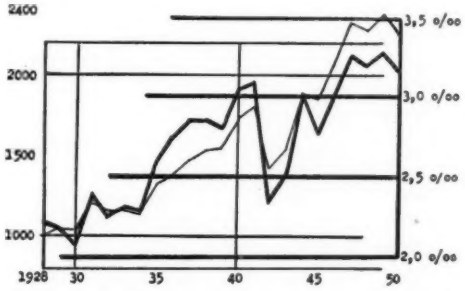


FIG. 4. Mortality from arteriosclerosis and chronic myocarditis in Stockholm in 1928 to 1950, according to official statistical nomenclature and figures. Fine line—absolute figures. Thick line—mortality rate per thousand. Further explanation given in the text.

official Stockholm figures of mortality from arteriosclerosis and chronic myocarditis (the latter diagnosis corresponding closely to arteriosclerotic coronary disease). First it may be pointed out that the general rise of these curves does not represent a real increase of these two diseases. As a matter of fact, the rise is more seeming than real, for it depends first of all on the more common use of the two terms arteriosclerosis and chronic myocarditis in the official death certificates.

Further, the material on which these figures are based is probably more reliable than in most other great cities. In Stockholm a large pro-

portion of the total number of deaths takes place in our numerous, good, and inexpensive hospitals and not in the homes, and therefore the diagnoses are clinically founded; autopsies will be performed in practically every case of interest. These curves show, as the previous, a valley in the early thirties and then a sudden and very deep decline during the crisis. It is needless to point out that this phenomenon cannot depend on the physician's mode of writing death certificates but on a real decrease of fatal cases of arteriosclerosis and chronic myocarditis. After the deep valley there is a peak, probably corresponding to an over-mortality. Because of the food restrictions, people with grave arteriosclerosis and myocarditis could prolong their lives a few years. The significance of the decline of the curves during the last few years is problematic.

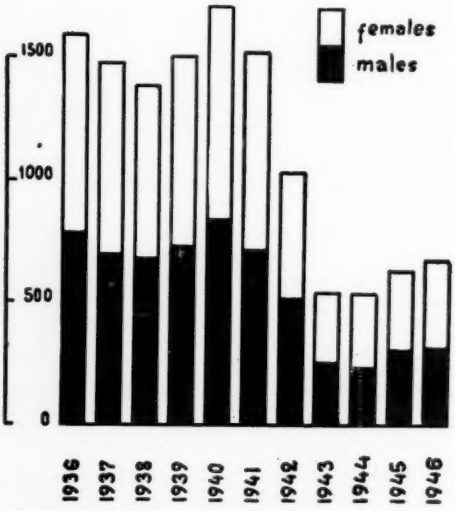


FIG. 5. Number of deaths from arteriosclerosis in Finland in 1936 to 1946, according to official statistics. White columns — females, black columns — males. (Vartiainen and Kanerva, 5).

The same observations were made in Finland, where the restrictions were much more rigorous than in Sweden, as shown in the two diagrams, fig. 5 and 6, from an investigation by Vartiainen and Kanerva (5). Figure 5 shows the mortality from arteriosclerosis in Finland among women and men according to official figures before and during the war. Figure 6 demonstrates the incidence of this disease in the autopsy material before and during the war and the distribution among different age classes. These diagrams show the same tendency as the Swedish curves—a marked decline of the disease during periods of restrictions of food, especially eggs, fats, and fat meat.

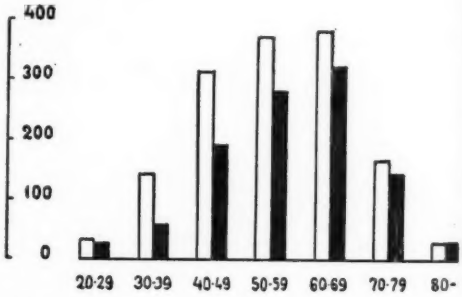


FIG. 6. Arteriosclerosis in Finland before and during the war. Positive findings subdivided according to the age of the postmortem cases. White columns—peacetime material, black columns—wartime material. (Vartianen and Kanerva, 5).

These Swedish and Finnish experiences can be regarded as a giant experiment on man, showing in an incontestable manner the role played by diet in the etiology of arteriosclerosis.

We have similar experiences from Denmark and Norway, but there seems to be no publications on the subject. Also in Central Europe the grave and prolonged nutritional crisis led to a decline in various metabolic diseases, among them arteriosclerosis. There are publications about diabetes, diabetic coma, and acidosis, but unfortunately no publications of value about the behavior of arteriosclerosis.

In this connection the incidence of gall stones in my large and carefully registered postmortem material may be of interest; there is a similar decrease in the occurrence of stones during the crisis years (fig. 7).

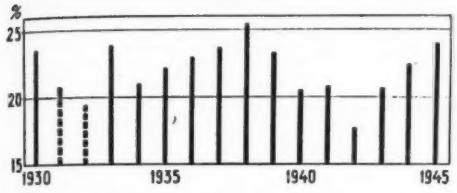


FIG. 7. Frequency of gall-stones in the postmortem material of St. Erik's Hospital, Stockholm in 1930 to 1945 (about 11,000 autopsies). The occurrence of stones in 1931 and 1932 (stems of short dashes) is uncertain. The relatively short stems in 1934 and 1935 seem to correspond to a period of economic depression. During the war with its rigorous restrictions in meat, fats, and eggs there is a marked decrease in the frequency of stones, especially in 1942.

SUMMARY

Investigations on the geography of arteriosclerosis must be based on a sufficiently great and uniformly registered autopsy material, if possible from a homogenous population with a high average age. Investigations from three different parts of Sweden with different conditions of life have shown considerable differences in the occurrence and degree of the disease. Investigations on the occurrence of arteriosclerosis and its significance as a cause of death in Sweden and Finland during a short historical period of food restrictions show close connections between dietary conditions and the incidence of the disease.

REFERENCES

1. Anitschkow, N. N.: Pathologische Anatomie und allgemeine Pathologie der Arteriosklerose. *Compt. rend. III Conf. Internat. Path. Géograph.*, Utrecht, 1934, 44-101.
2. Henschen, F.: *Om förändringar i det svenska sjukdomspanoramat under de sista 50 åren* (On changes in the Swedish panorama of diseases during the last 50 years). Bonniers, Stockholm, 1947.
3. Lundquist, C. G., and Björnwall, J.: Iakttagelser över arteriosclerosen i Norra Sverige på grundval av obduktionsmaterialet vid Centrallasarettet i Umeå (Observations on the arteriosclerosis in North Sweden based upon the postmortems of the Umeå Central Hospital). *Svenska läk.-sällsk. förhandl., 33:* 1209-1215, 1936.
4. Sjövall, H., and Wihman, G.: Beobachtungen über die Arteriosklerose in Schweden samt einem Beitrag zur Frage der Lipoidose der Arterienintima. *Acta path. et microbiol. Scandinav. Suppl. XX*, Levin & Munksgaard, Copenhagen, 1934.
5. Vartiainen, I., and Kanerva, K.: Arteriosclerosis and War-time. *Ann. med. int. Fenniae, 36:* 748-758, 1947.

Submitted for publication October 4, 1951

The author's address is:

DR. FOLKE HENSCHEN

KAROLINSKA SJUKHUSET

STOCKHOLM 60, SWEDEN

Effects of Castration and the Processes of Aging in Male Rats and Man

V. KORENCHEVSKY, SHEILA K. PARIS, AND B. BENJAMIN

SEVERAL investigators have suggested a close relationship between decreased endocrine function of gonads and onset of old age. The aim of the present paper is to elucidate the true nature and extent of this relationship in males. From this point of view it is important to study the effects of gonadectomy on the processes of aging, since the ensuing drastic decrease of sex hormones clearly demonstrates the effects of their deficiency. In a subsequent paper the effects of sex hormone administration on the processes of aging will be considered.

In previous papers (53-56, 59) such investigations were performed on female rats, and it was concluded that ovariectomy hastens certain processes of aging, while hormones exert an opposite action and some other effects on some of these processes.

In the present paper the effects of castration were studied on male rats of various ages, and the results obtained were compared with the data observed by other investigators in man.

TECHNIQUE

Experiments were performed on three strains of rats: on 151 rats of L strain, 140 rats of M strain, and 41 rats of R strain, a total of 332 rats, of which 111 animals were castrated. Rats aged 605 and 635 days (tables 3 and 4) were castrated at the advanced age of 510 and 515 days respectively, the other rats soon after weaning, usually between 22 and 35 days. The subdivision of the rats into groups, their age, and other detailed data are given in tables 1-4.

Besides the difference in strains, there was also some difference in the feeding of the animals. Therefore only the groups of rats belonging to the same strain are comparable.

Except in a specially designed experiment on 360 day rats (table 3, cols. 3 and 4), the other animals represented the controls used in various experiments conducted during the last fifteen years. Therefore the similar results obtained are especially significant since they were shown on rats of different strains killed at different dates.

For estimating the relative weights of organs per 200 Gm. of body weight, the "fat-free" body weight was used for the same reasons as given in our previous papers (45, 52, 53, 59). As in our previous experiments, in the present investigation the rats were killed by bleeding from the abdominal aorta. Therefore the blood-free weights of the organs were examined and recorded in the tables.

In male rats the fat attached to the testes (S fat) was removed with these organs at castration. Therefore, for comparison with normal intact rats, the total body fat was calculated only from the dissected retroperitoneal fat (R fat). For these calculations the formula was worked out by one of us (Benjamin) from the weights of S and R fats of normal intact rats of various ages. In spite of individual fluctuations the weight of testicular fat could be represented $S = \frac{R}{1.3}$. Therefore, presuming that in normal rats the R + S fats constitute about 32 per cent of the total body fat, the following formulas were used: in normal rats the total body fat was estimated as being approximately equal to about $\frac{R \times 100}{18}$, in castrated rats to $\frac{(R \times 100)}{18} - \left(\frac{R}{1.3}\right)$, since

Presented at the Second International Gerontological Congress and Fourth Annual Scientific Meeting of the Gerontological Society, Inc., September 9-14, 1951, St. Louis, Missouri. Published on a grant from the Forest Park Foundation.

TABLE 1. EFFECT OF AGING ON RELATIVE WEIGHT OF RETROPERITONEAL FAT AND ORGANS PER 200 GM. OF FAT-FREE BODY WEIGHT IN NORMAL MALE RATS OF THE STRAINS M AND R.

	Strain M						Strain R		
Average Age in Days	55	145	360	605	635	765	39	207	480
Testes, Gm.	2.33	2.09	1.62	1.56	1.42	1.54	1.80	1.86	1.49
Seminal vesicles, mg.	157	685	569	644	678	635	64	633	604
Prostate, mg.	438	855	854	836	868	1021	233	876	927
Penis, mg.	249	221	239	230	228	238	165	231	231
Preputial glands, mg.	113	71	88	163	136	99	88	108	84
Adrenals, mg.	48.2	31.4	30.7	33.3	30.5	30.9	46.8	30.4	29.2
Thyroid, mg.	23.8	14.9	15.5	16.2	15.8	13.6	33.5	36.8	27.2
Hypophysis, mg.	13.0	8.0	9.1	7.8	7.5	8.9	9.9	7.4	7.8
Thymus, mg.	509	179	59	50	49	57	487	101	35
Liver, Gm.	9.72	7.82	7.65	7.71	7.59	6.91	9.13	8.43	7.07
Kidneys, Gm.	1.82	1.48	1.42	1.53	1.44	1.40	1.51	1.35	1.25
Spleen, mg.	1452	446	577	625	537	506	673	362	397
Heart, mg.	926	689	705	761	664	682	875	765	688
Brain, Gm.	3.35	—	1.55	1.39	1.27	1.40	2.91	1.43	1.17
Retroperitoneal fat, Gm.	1.0	7.0	7.4	7.9	8.1	7.6	0.7	9.3	7.8
Body weight, Gm. (actual)	109	330	355	371	402	371	143	420	505
Number of rats in group	18	17	19	7	6	27	10	12	19

TABLE 2. EFFECTS OF AGING ON RELATIVE WEIGHTS OF RETROPERITONEAL FAT AND ORGANS, PER 200 GM. OF FAT-FREE BODY WEIGHT, IN NORMAL AND IN CASTRATED RATS OF L STRAIN.

Age in Days	51–60	61–70		86–100		101–125		126–150	
Group of Rats	Normal	Normal	Castrated	Normal	Castrated	Normal	Castrated	Normal	Castrated
Testes, Gm.	2.20	2.28	—	2.07	—	1.97	—	1.83	—
Seminal vesicles, mg.	454	477	12	670	10	705	9	742	9
Prostate, mg.	637	622	54	806	52	745	53	788	47
Penis, mg.	268	227	64	254	62	217	65	207	69
Preputial glands, mg.	117	111	54	121	46	92	42	68	31
Adrenals, mg.	45	43	70	44	63	34	56	33	51
Thyroid, mg.	21.1	19.9	19.5	18.8	17.6	18.2	19.5	16.2	18.5
Hypophysis, mg.	10.2	7.3	13.6	8.3	11.1	6.8	11.5	6.6	8.9
Thymus, mg.	496	472	594	293	411	178	349	171	247
Liver, Gm.	10.09	9.79	9.77	9.47	8.19	8.78	7.56	8.19	7.22
Kidneys, Gm.	1.94	1.84	1.70	1.64	1.37	1.70	1.30	1.54	1.28
Spleen, mg.	561	511	603	466	477	412	463	432	394
Heart, mg.	794	739	746	694	692	677	670	663	640
Retroperitoneal fat, Gm.	5.1	6.2	7.1	8.9	10.7	7.8	9.8	10.8	11.3
Body weight, Gm. (actual)	211	261	255	322	311	370	317	419	353
Number of rats in group	11	23	7	27	23	14	19	11	16

TABLE 3. EFFECTS OF AGING ON ACTUAL WEIGHTS OF ORGANS IN NORMAL AND CASTRATED RATS OF M STRAIN.

Time of Castration	Early Castration				Late Castration			
Average Age in Days	145		360		605		635	
Groups of Rats	Normal	Castrated	Normal	Castrated	Normal	Castrated	Normal	Castrated
Seminal vesicles, mg.	947	12	843	29	978	15	1100	111
Prostate, mg.	1180	58	1262	72	1276	81	1419	208
Penis, mg.	305	80	352	110	349	91	376	300
Preputial glands, mg.	98	39	130	48	248	119	223	181
Adrenals, mg.	43.3	46.9	44.8	46.7	50.6	41.7	49.7	48.0
Thyroid, mg.	20.6	20.4	22.7	22.1	24.6	2.22	25.7	25.7
Hypophysis, mg.	11.0	13.9	13.3	17.3	11.9	13.7	12.2	15.5
Thymus, mg.	247	341	85	96	76	70	79	122
Liver, Gm.	10.80	8.55	11.26	7.77	11.73	7.42	12.47	9.02
Kidneys, Gm.	2.05	1.57	2.08	1.53	2.32	1.51	2.36	1.81
Spleen, mg.	616	620	839	747	951	619	877	779
Heart, mg.	952	859	1032	827	1158	864	1088	950
Brain, Gm.	—	—	2.26	2.22	2.10	2.01	2.07	2.10
Retroperitoneal fat, Gm.	9.6	11.7	10.9	15.4	11.9	17.8	13.2	13.7
Body weight, Gm. (actual)	330	317	355	328	371	320	402	327
Number of rats in group	17	14	19	19	7	6	6	7

TABLE 4. EFFECTS OF AGING ON RELATIVE WEIGHTS OF ORGANS PER 200 GM. OF FAT-FREE BODY WEIGHT IN NORMAL AND CASTRATED RATS OF M STRAIN.

Time of Castration	Early Castration				Late Castration			
Average Age in Days	145		360		605		635	
Groups of Rats	Normal	Castrated	Normal	Castrated	Normal	Castrated	Normal	Castrated
Seminal vesicles, mg.	685	10	569	23	644	13	678	86
Prostate, mg.	855	44	854	57	836	70	868	160
Penis, mg.	221	62	239	87	230	79	228	229
Preputial glands, mg.	71	30	88	38	163	101	136	140
Adrenals, mg.	31.4	36.0	30.7	37.0	33.3	36.0	30.5	37.0
Thyroid, mg.	14.9	15.7	15.5	17.5	16.2	19.1	15.8	19.4
Hypophysis, mg.	8.0	10.7	9.1	13.7	7.8	11.8	7.5	11.8
Thymus, mg.	179	261	59	76	50	61	49	93
Liver, Gm.	7.82	6.56	7.65	6.10	7.71	6.36	7.59	6.91
Kidneys, Gm.	1.48	1.20	1.42	1.21	1.53	1.30	1.44	1.39
Spleen, mg.	446	476	577	583	625	521	537	595
Heart, mg.	689	659	705	651	761	746	664	726
Brain, Gm.	—	—	1.55	1.76	1.39	1.74	1.27	1.62
Retroperitoneal fat, Gm.	7.0	9.0	7.4	12.0	7.9	15.4	8.1	10.4

the testicular fat $\frac{(R)}{(1.3)}$ was removed at castration.

It is necessary to emphasise that this estimation of the total body fat can give only approximate figures. A special investigation is needed in order to work out more accurate formulas for rats of different ages fed different diets. The use, however, even of this approximate method in estimating the "fat-free" body weight lessens considerably the great error which otherwise would occur in the interpretation of the changes in the relative weight of organs per unit of body weight.

For a comparison of the changes in relative weights of organs, it is usually not important if the organs are compared in animals retaining various amounts of water. With a few exceptions of local edema, the water, if retained, usually is distributed in all organs and tissues.

Therefore, in our rats killed by bleeding, the ratio of the weight of organs per unit of body weight may remain unchanged or changed irrespective of the water retained in the organism.

Without histologic investigation, however, it is impossible to interpret the functional significance of the changes in the weight of the organs or to ascertain exceptional cases of local oedemas.

Methods of histologic investigation, including measurement of the cells, their nuclei, large cardiac fibres, and the zones in the adrenals were described in a previous paper (59). A modification of the paper replica method was used in the study of the hepatic and adrenal fasciculata cells and nuclei and renal nuclei. Instead of outlining the cells and nuclei on the usual type of paper, they were magnified from the negatives onto the photographic paper; then the replicas were cut out and weighed.

Most results expressed in figures were statistically analysed by Fisher's t-test for small samples by Benjamin, who in this way contributed to the paper. When two statistical P values are given (e. g., $P < 0.05 - 0.001$), it is to designate that the values were different in the various groups referred to, lying in each group on a certain figure between the limits quoted.

Macroscopic and Chemical Body Changes

Body Fat

From previous investigations it is known that body fat increases with aging in rats (45, 49, 70). In man the same tendency is observed in most cases, but thin old persons are not unusual. After castration both in the rat (42, 49, 52) and in man (41) in most cases various degrees of increased fat deposition were recorded.

In the present experiments the same results were obtained (tables 1-4), confirming that with aging and after castration a similar tendency to obesity develops in most cases. Because of individual variations, however, the changes in fat deposition were not always statistically significant.

Water and Nitrogen Content

Effects of Aging.—It has already been explained why for estimation of relative weights of organs the changes in water content of the organism have comparatively small effect, if any. So far it has been accepted that dehydration of the tissues is a typical senile change. Latest investigations of Lowry and associates (65, 66), in agreement with some previous experiments reviewed by them, indicate that this might not be so.

During the period of growth, i. e., from childhood up to adulthood, Lowry and his associates found that there is a relative increase in the proportion of cells caused by the growth of tissues and a resultant decrease in the amount of extra- and intercellular fluids. This leads to the well known decrease in general water content of the tissues. Although, because of this a dehydration seems to be present in the growing tissues, actually there is little, if any, evidence of any marked alteration in the intracellular composition or in the intercellular fluid.

During the period of senescence, i. e., from adult to senile age, there is a relative increase in intercellular fluid of the tissues and organs and apparently no change in cytoplasm and the intracellular water content. Thus, contrary to the deep-seated belief that dehydration is an attribute of the very old, Lowry and Hastings consider that hydration, and not desiccation, is a senile change. This increase in water may be a kind of intercellular oedema caused by the senile atrophy of the cellular elements, which leaves a greater space for extracellular fluid.

These data obtained in rats are in agreement with similar data obtained in human beings by Simms and Stolman (88), who compared the tissues of the liver, kidneys, spleen, heart, and muscles from persons over 70 years old with those from persons 30 to 40 years old. They found an increase in water content of from 0.8 to 2.6 per cent (except in the heart). When calculated per unit of dry weight, these values became even more significant.

Simms and Stolman also investigated the nitrogen content in these organs and found that it decreased (except in the liver) by 3 up to 13 per cent. It is necessary, however, to emphasise that the fat was not extracted from the organs they investigated, which might partly explain the nitrogen decrease. Visscher and King (96), however, in fat-free carcasses of mice aged 18 months, when compared with mice six months old, also found nitrogen decrease (6 per cent), and an increase of free cholesterol.

Effects of Castration.—Korenchevsky and Dennison (48) investigated the chemical composition of the hind legs of normal and castrated littermate rats, aged about 210 days. The nitrogen content of dry legs was found to be decreased by about 8.4 per cent in castrated rats. Probably this decrease was partly due to the increased proportion of fat in the bodies of the castrated animals.

The water content in these legs was decreased by about 4.2 per cent in only 2 of the 4 litters investigated, namely, in those rats in which the body fat was considerably increased. This probably explains an apparent water decrease.

Thus, while nitrogen changes in old age and after castration seem to be similar, water changes seemed to be slightly different.

In the experiments of Lüthje (67) on dogs the data, recalculated by Korenchevsky and Dennison (48), are in agreement with the results obtained on rats.

Because, however, of the small changes obtained, further investigations of the chemical changes, in particular in normal and castrated old individuals, are necessary for definite conclusions.

Relative Hypoplasia of Organs with Aging and After Castration as Indicated by Changes in Relative Organ Weights

Effects of Aging.—In the previous papers the weight of organs in male rats of various ages was calculated per unit of body weight with (42, 49) and without (45) body fat. In the latter paper the literature on the subject was reviewed, and for men and women the relative weight of organs was recalculated from actual weights given by various authors.

In the other papers these data were investigated in female rats (53, 59).

Both in males and females the results obtained were in agreement with those of Donaldson (21) and those which were recalculated from the actual weights given by Walter and Addis (98). Yeakel and Farris (108) found that the average weight of the liver in male rats 500 days old was 11 Gm., but it fell to 9.68 Gm. at the age of 1000 days. Kaufman (39) considers that in man the decrease of the senile kidneys, heart, pancreas, brain, and skeletal muscles represents the purest form of simple atrophy. Of the same opinion are Furno (25) (on the kidneys) and Goldzieher (27) (on the adrenals).

In the present investigation the previously obtained results are confirmed. Thus, the data in table 1 and columns "normal" in table 2 show that with aging a relative hypoplasia of the following organs develops ($P < 0.01$ —

0.001): the testes, adrenals, thyroid, hypophysis, thymus, liver, kidneys, spleen, heart, and brain.

Secondary sex organs (seminal vesicles, prostate, penis, and less definitely, the preputial glands), after reaching the maximum development at sexual maturity, do not decrease definitely in their relative weight up to the age investigated (675 days).

It is important, however, to emphasise that the usual span of life of the rat is at least three years. Therefore, in our previous and present investigations the effects of senescence, not senility, were examined.

The relative hypoplasia develops more rapidly during the earlier stage of life, e. g., the first 5 to 6 months. After this period hypoplasia develops at a slower rate or becomes more or less stationary (table 1). This conclusion is in agreement with the previous results obtained in rats (21, 45, 49, 98). In man, however, in some cases the relative hypoplasia of organs may continue steadily throughout life (45).

In general our observations are also in agreement with those of Minot (73), who found the greatest rate of aging in the earlier states of the life span.

In the previous paper (45) the possible significance of the relative hypoplasia of organs in the development of aging was discussed. Here it is necessary to mention only that this hypoplasia might be considered as an early latent stage of the aging involution and atrophy, which at the final senile period of life is manifested in frank senile atrophy and degeneration of organs. A different interpretation of the exceptionally great relative hypoplasia of the brain was also given previously (59, p. 145).

Effects of Castration.—At the various ages investigated the effect of castration on the relative weight of the organs is recorded in tables 2 and 4. All the rats referred to in table 2 and in the first 4 columns of tables 3 and 4 were castrated before sexual maturity at the age of 22 to 35 days. In the last 4 columns of tables 3 and 4 the data refer to the rats castrated in the advanced age of about 510 to 515 days.

In agreement with the previous investigations (42, 49, 52), after early castration the following changes were found: atrophy of the secondary sex organs, delayed involution of the thymus, hypertrophy of the hypophysis, and hypoplasia of the liver, kidneys ($P < 0.01 — 0.001$), and heart (tables 3 and 4, cols. 4; $P < 0.01$). Cardiac hypoplasia, as shown both by actual and relative weights, usually develops a long time after castration (about 11 months later in the present experiments). This is in agreement with the observations of Bauer and Bollinger (7) who found the following weights of the heart per kilo of body weight: in bulls 5.4 Gm., in oxen 3.9 Gm., in stallions 7-11 Gm., in geldings 5.8 Gm.

If judged by weight only, no definite significance can be attached to the changes in the weight of the thyroid, since, for example, accumulation of colloid in a depressed gland increases its weight, while the absorption of colloid in the active gland decreases its weight.

Some difference from the previous results (28, 29, 49, 52) was observed in the present experiments in the case of the adrenals: as previously, their hypertrophy (as judged both by actual and relative weights) was found in the L strain (table 2), but in the M strain it was recorded in relative weight, and was statistically significant only in some cases (table 4, col. 4, $P < 0.01$). This fact might suggest a somewhat different reaction in different strains, although, as will be shown later, histologically similar changes were observed in both strains.

It is known that the results of late castration are less pronounced than of prepuberal castration. In the present experiments, in which gonadectomy was performed at 510 to 515 days (tables 3 and 4, cols. 5-8), the changes were similar to those observed after early castration (table 2, and cols. 1-4 in tables 3 and 4), but they were statistically significant only in some cases. Thus, in rats aged 605 days the significant changes in actual weights ($P < 0.001$) were in the sex organs, liver, kidneys, and

heart, and ($P < 0.01$) spleen; in relative weights in the sex organs, liver, kidneys, hypophysis, and brain ($P < 0.01 — 0.001$).

In the experiment on rats aged 635 days the significant changes in actual weights ($P < 0.02 — 0.001$) were in body weight, sex organs, the hypophysis, liver, and kidneys; in relative weights in the hypophysis, thymus and brain only ($P < 0.01 — 0.001$).

Two other points are of interest. The actual weight of the brain does not change significantly after castration (table 3), but the relative weight (table 4) increases because the castrates are smaller and usually fatter than the normal controls; the thymus, delayed in its involution during the first months after castration, undergoes considerable aging involution by the age of about one year, and the effect of aging becomes stronger than that of castration.

Our results on the development of hypoplasia following castration were confirmed by Lawless (62) and Tang (93) in investigations of the liver; by Masui and Tamura (69) and Lawless (62) (kidney); by Lawless (62) (heart); by Tang (93) (adrenals).

The effect of castration on body weight (decrease) was recorded repeatedly in our previous experiments, and the literature on the subject was reviewed in our above mentioned papers.

Comparison of the Effects Produced by Aging with those Produced by Castration on the Weight of Organs

Within the age range investigated, more or less similar effects both of aging and also of castration were found in the relative hypoplasia of the liver, kidneys, heart and, sometimes, of the spleen.

Different effects, however, were recorded in the other changes: with aging there is a hypoplasia of the thymus, adrenals, thyroid, and hypophysis, but after castration a delayed involution of the thymus and hypertrophy or no change in the other three glands occur. There is also a great difference between the drastic atrophy of the secondary sex organs after castration and the inconstant and often small changes with aging.

A greater relative hypoplasia of the liver, kidneys, and heart, which occurs in castrated rats, as compared with that in their normal intact littermates, suggests that castration accelerates the processes of aging in these organs.

Histologic Changes

Sex Organs.—As in the previous experiments (50), in the present investigation in the intact normal rats the microscopic picture of the seminal vesicles, coagulating gland, and prostate was normal. In the testes, about half of these rats had normal seminiferous and Leydig's tissues, while the others showed slight decrease in the number and irregularity in disposition of spermatozoa, and in a few rats there was in addition some twisting, fusion, or swelling of the heads of spermatozoa. In castrated rats, on the contrary, severe atrophic changes, described by several authors, were present in the secondary sex organs.

It is necessary, however, to remember that our rats were senescent and not senile animals.

In old men the prostate is of special importance because of the several changes or diseases which affect it. A very thorough investigation was made and a clear description of the senile changes in this organ was given by Moore (74). From the age between 50 and 65, he found the pronounced atrophic changes in the prostatic epithelium, acini, and smooth muscle, and an increase of fibrous tissue, i. e., changes similar to those produced by castration.

Hospital material, however, was used by Moore for his investigation. Obviously this cannot provide the prostates from those exceptional old men who remain in good health and preserve their sex function, and presumably the normal structure of their sex organs, up to advanced old age. Investigation of the material from such old men (e. g., those killed in accidents) would be very valuable. The experiments on animals (e. g., our senescent rats) suggest that the usual changes in the prostate of old men also might belong to the

category of the degenerative diseases of the abnormal old age of the present day, i. e., they might not be necessarily present in the physiologic normal senility.

Adrenals

Effects of Aging.—In older mice Loeb (63) described an increased fibrosis of the adrenal cortex, in some cases resulting in the destruction of a considerable part of the cortical parenchyma. Yeakel (106, 107) found that relative size of the adrenal cortex in male rats is largest at the age of 50 to 100 days, is considerably decreased at the age of 300 days, and becomes still smaller in rats aged 700 days and older. In old rats nodular hyperplasias of the medulla and vascular, sometimes very large, dilatations are often observed. Some of the medullary hyperplasias could be defined as tumours. These hyperplasias and vascular dilatations increased the absolute and relative weight of the adrenals in old rats.

In the men of 50 to 76 years old Delamere (19) also found an increase in the weight of the adrenals (5 to 6 Gm. instead of about 4.8 Gm.) caused by adenomatous hyperplasias in the z. fasciculata. He also described arteriosclerosis of the adrenal blood vessels, which in its turn produced atrophic and degenerative changes in the cortex and medulla and an increased amount of fibrous tissue. Cooper (13) found that in early childhood the z. glomerulosa is well developed, z. fasciculata only a few cells wide, and z. reticularis hardly noticeable. With advancing age the two latter zones develop more and more. In old age a general sclerosis of the adrenals develops.

In the present experiments the number of mitoses in the adrenal cortex was decreased from 2.4 (in a standard area) at the age of 39 days to 0.1 at the age of 635 days (table 5).

Measurements (table 6) showed that the fasciculata cells in adult and senescent rats were considerably larger than in young animals ($P < 0.01$). The nuclei, however, remained about the same size, the variations being small and statistically significant ($P < 0.02$) only at the age of 360 days (figs. 1 and 2). Because of this the nucleo-cytoplasmic ratio was considerably greater in the young rats ($P < 0.01$).

Small vascular lacunae were observed in the medulla of some of the senescent rats, but there

TABLE 5. AVERAGE NUMBER OF MITOSES IN STANDARD AREA IN ORGANS OF RATS (LINES 1 TO 6); AND OF SPLENIC GIANT CELLS (LINE 7).

Organs	Young Rats	Senescent Rats	
		Normal	Castrated
1. Adrenals	2.4	0.1	0.2
2. Thyroid	5.6	0	0
3. Parathyroids	31.7	3.4	7.1
4. Liver	77.7	2.4–2.5	1.7–4.8
5. Kidneys	11.0	0.7–1.2	0.6–1.1
6. Spleen (mitoses)	262	49	45
7. Spleen (giant cells)	123	30	29

The counts were made in 10 young rats aged 55 days and in 13 normal and 13 castrated senescent rats aged 605 and 635 days (pooled).

TABLE 6. ADRENAL FASCICULATA CELLS IN NORMAL AND CASTRATED RATS.

Age Groups (Days)	Average Weight of Paper Replica (Mg.) of					
	Cytoplasm		Nucleus		Ratio Nucleus to Cytoplasm	
	Normal	Castrated	Normal	Castrated	Normal	Castrated
39–55	5.15	—	1.70	—	1:3.0	—
360	11.48	16.75	1.59	1.78	1:7.2	1:9.4
635	11.37	13.49	1.74	1.75	1:6.5	1:7.7

In normal rats aged 39–55, 360, and 635 days the measurements were made in 6, 7, and 6 rats, respectively; in castrates aged 360 and 635 days in 7 and 6 rats, respectively.

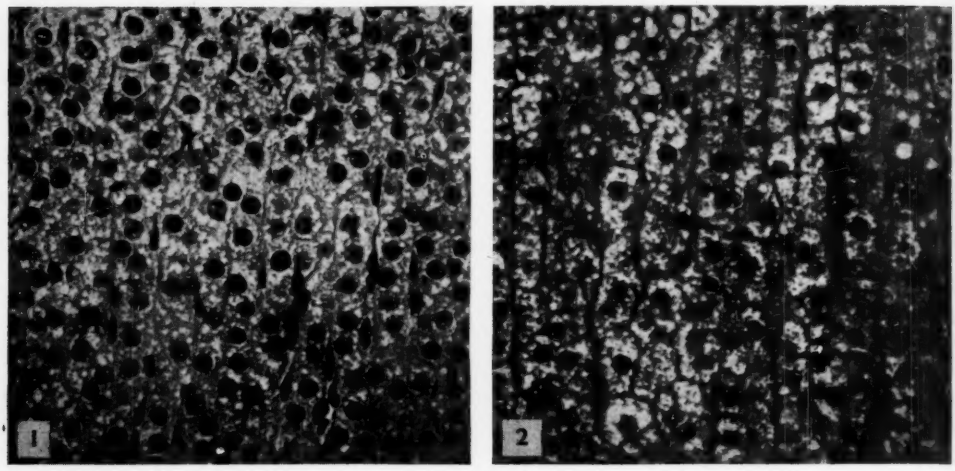


PLATE 1

Adrenal fasciculata zone. Haematoxylin + Eosin. X 430.

FIG. 1. Normal young rat aged 39 days. Small cells with large nuclei.

FIG. 2. Normal rat aged 480 days. Compensatory hypertrophy of aging cells. Nuclei of about the same size as in young rats but cytoplasm considerably increased.

were no sclerotic changes in the adrenal blood vessels.

Effects of Castration.—The histologic changes in the adrenals of castrated rats, described in the previous papers (28, 29), were confirmed in the present investigation.

Thus, in the castrates, the fasciculata cells were larger than in the normal controls and more vacuolated because of the greater number of lipoid granules. Therefore, in the photomicrographs (figs. 3-6) the cells of castrates are lighter than in the normal controls. Also, in most cases the demarcation zone was less distinct because of the same changes as in the z. fasciculata.

Measurements (table 6) showed that, in contrast to the smaller cells in other organs after castration, the cytoplasm of the cortical cells of the adrenals was larger in the castrates than in normal rats ($P < 0.01$), while the size of the nuclei did not change definitely or increased only slightly. Therefore the nucleus-cytoplasm ratio in the castrates was smaller than in the normal rats of the same age ($P < 0.01$).

The histologic changes in the rats castrated in advanced age (table 6, last line) were still present, but were less pronounced than in the rats castrated at an early age.

Nests of syncytial degeneration in the z. glomerulosa and z. fasciculata have been previously described (59). In the present experiments they were found in rats aged 360 days and older in about the same percentage both in the normal controls (30 per cent) and in the castrates (27 per cent). The degenerations were absent in the young rats.

Thus, in rats, the aging processes and castration produced different changes in the weight and certain histologic features of the adrenals. Nevertheless castration accelerated and intensified the decrease of the nucleocytoplasmic ratio in the adrenal cells.

Thyroid

Effects of Aging.—Just as in the case of the gonads, the decreased function of the thyroid was often considered to be responsible for premature senility. This theory was supported by finding enlarged follicles with flattened

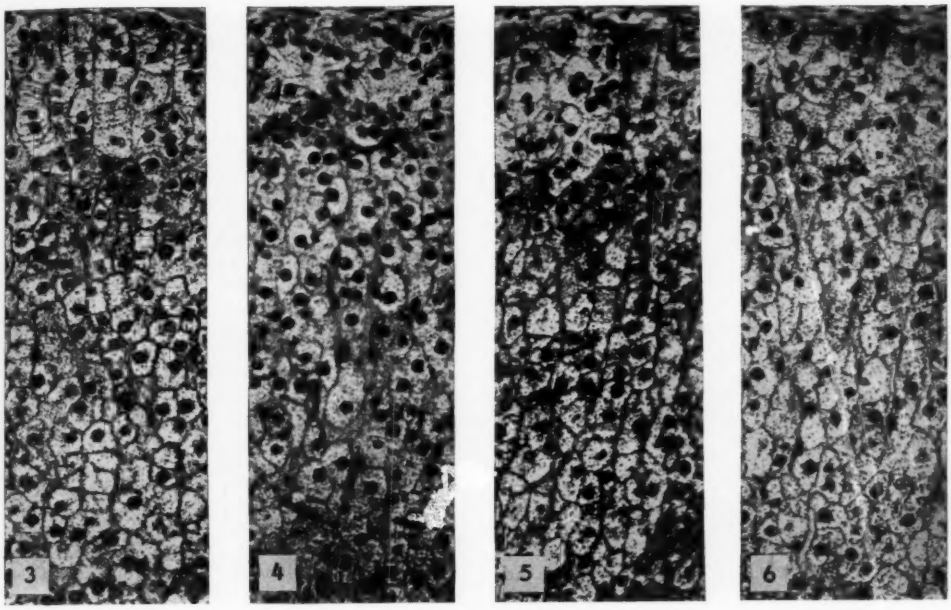


PLATE 2

Adrenal cortex. Haematoxylin + Eosin. X 310.

Part of outer region of adrenal cortex consisting (from top to bottom) of fibrous capsule, z. glomerulosa, demarcation z., and upper part of z. fasciculata.

FIG. 3. Normal control rat aged 360 days.

FIG 4. Littermate rat of the same age, castrated at the age of 39 days. Fasciculata cells considerably enlarged and more vacuolated (with lipoids) than those in fig. 3.

FIG. 5. Normal control senescent rat aged 635 days. Similar to fig. 3.

FIG. 6. Senescent rat aged 635 days, castrated at the age of 510 days. Late castration changes similar to those in fig. 4 but less pronounced.

epithelium and accumulated colloid in the thyroid, and also by various degenerative or atrophic changes of this gland in old animals and men (3, 13, 64, 76, 91). Loeb (63) describes severe sclerosis of the thyroid in some strains of senescent mice, although it was absent in other strains. Recent investigations (39a, 61a) suggest a correlation between hypothyroidism and the incidence of arteriosclerosis.

Other investigators, however, recorded that a hyperactive thyroid is frequently found in senile individuals (16, 17, 20, 76). Some of them even considered the hyperactive thyroid to be more typical for old men than the atrophic gland. In our rats 360 and even 675 days old a still active thyroid was observed with cylindrical epithelium of medium height and a comparatively small or medium amount of colloid. In some glands, however, the epithelium was cubical, the hard colloid had accumulated, and fibrous tissue had increased. No mitoses were observed in the senescent animals (table 5).

Effects of Castration.—In our experiments, after castration a decreased activity of the thyroid was found, as manifested by cubical or flattened epithelium, increased amount of hard colloid and, in some rats, an increased amount of fibrous tissue (figs. 7-10). As in the case of the adrenals, this effect was less pronounced after late castration (figs. 11 and 12).

Merjeievsky and Okunev (71) found in the thyroid of oxen, as compared with that in bulls,

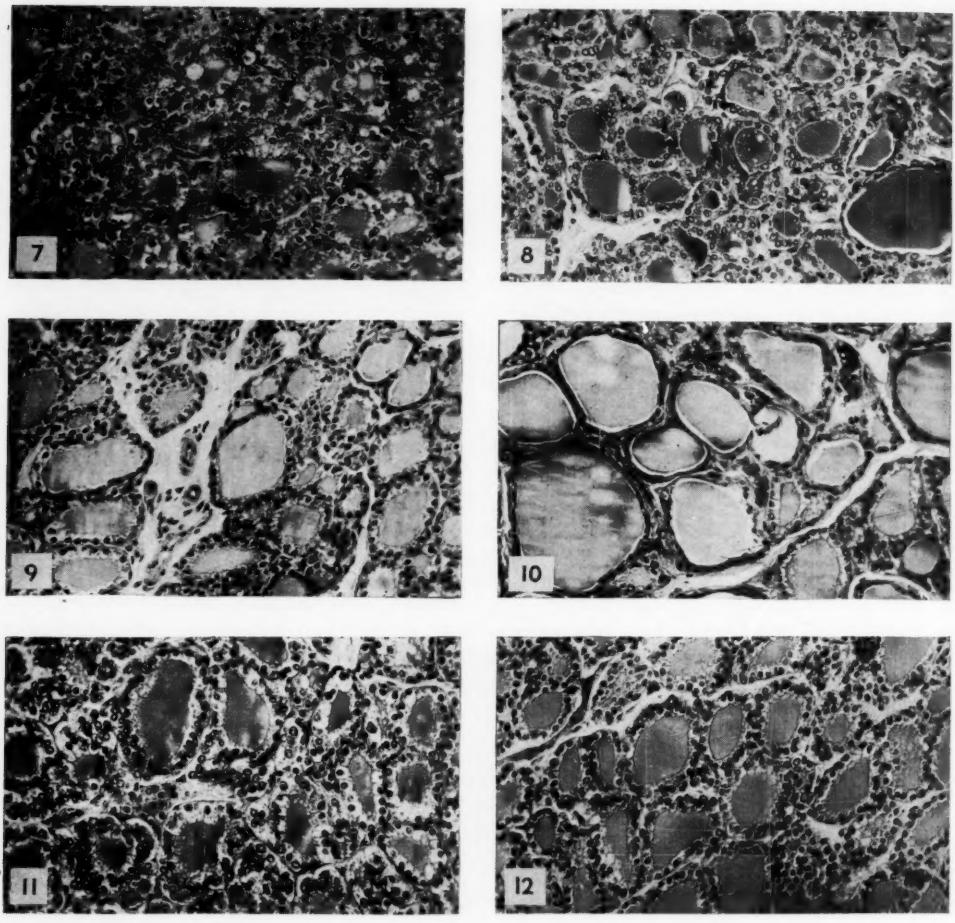


PLATE 3

Thyroid. Haematoxylin + Eosin, X 180.

FIG. 7. Normal control rat aged 360 days. Active thyroid with low cylindrical cells, small amount of colloid and fibrous tissue.

FIG. 8-10. Three littermates of the same age castrated at the age of 39 days. Three stages of the thyroid depression: mild in fig. 8, medium in fig. 9, and pronounced in fig. 10. Flattening of the epithelium, increase of colloid and fibrous tissue.

FIG. 11. Normal control senescent rat aged 635 days. Active thyroid.

FIG. 12. Senescent rat of the same age, castrated when 510 days old. Mild depression of the thyroid after late castration.

an increased amount of fibrous and fat tissue and smaller epithelium; in castrated rabbits—flattened epithelium and accumulation of hard colloid.

A comparison of aging and castration changes in the thyroid indicates the following relationships:

1) the thyroid structure after castration is

more or less similar to that in those cases of senility in which this gland is depressed or atrophic.

2) Castration should intensify the aging processes in the atrophic senile thyroids and depress the hyperactive senile glands.

Parathyroids

Effect of Aging.—Cooper (13) found that in the human parathyroids the number of oxyphil cells, mast cells, and eosinophil leucocytes increased with aging. In old age an increased amount of fibrous tissue and fat cells appears, and sometimes the parathyroid cells start to excrete colloid, in this way forming the follicles.

Gilmour and Martin (26) recorded a decrease in weight of the parathyroid parenchyma, i. e., of the number of cells, in old age. On the average, in children it weighed about 25.3 mg., in men from 21 to 30 years old 92.8 mg., from 50 to 60 years 78.9 mg., and from 71 years and over 74 mg. They also found an increase of fat tissue in "old" parathyroids: there was about 8.9 per cent in adults of 21 to 30, and 51.3 per cent in men of 71 and over.

Loeb (63) found a pronounced sclerosis of the parathyroids in the same strains of old mice in which he observed thyroidal sclerosis. This change appeared usually from the age of 15 months.

In our senescent rats, the fibrous tissue was increased in various degrees, in one case up to the stage of sclerosis, and the number of mitoses was considerably decreased (table 5). In the sclerotic parathyroid the fibrous tissue in places compressed and atrophied more or less large areas of the parathyroid cells.

No difference was observed between the parathyroids of intact rats and those of castrated animals. Thus, as judged by the tests made, castration apparently did not affect the process of aging in these glands.

Hypophysis

Effect of Aging.—Hunt (36) found that in the rat hypophysis the number of mitoses decreased from 78 at the age of 96 days to 5 in animals 300 days old.

Wolfe and associates (102-104) observed that the level of eosinophils was lower and that of chromophobes higher in old rats than in young animals. They also recorded the appearance of nests of hypertrophied chromophobe cells and an accumulation of colloid between and in the cells. The hyperplasias in some cases were transformed into true hypophyseal adenomas.

Parsons (82) in agreement with some other investigators found the following changes in the human hypophysis in old age: 1) the appearance of small and numerous vacuoles in the cells (which, however, never formed the Signet rings); 2) an increased amount of interstitial tissue and pigment granules; 3) nests or nodules of hyperplasias which through various transitional stages might become true adenomas; 3) the invasion of the posterior lobe by basophils.

Cooper (13) also considers the level of oxyphils to be lower in old age, all three types of hypophyseal cells being approximately in similar numbers.

Witschi and Riley (101), and Henderson and Rowlands (33) found an increased gonadotropin potency to be often present in the hypophyses of old men, but not in all cases. Thyrotropic and lactogenic hormones were not increased. Heller and Myers (31) confirmed this by finding an increased gonadotropin excretion in the urine, but only in some old men. Most probably this happens only in those cases in which the testicular endocrine secretion is considerably decreased. This conclusion is supported by the observations on gonadotropin content in the hypophysis and urine of castrates.

Effect of Castration.—At present several investigators have established the fact that the hypophyses in castrates contain a considerably increased amount of gonadotropins. According to other observations, an increased excretion of gonadotropins in the urine always occurs after gonadectomy and also in the cases

of eunuchoidism and other forms of testicular deficiency (24, 31, 32, 40).

Many authors have also described histologic changes in the hypophyses of castrates, the most striking of which are the increased number of basophils and their special vacuolation with formation of Signet-ring cells.

A comparison of the hypophyseal changes in old age (hypoplasia or atrophy of the gland, but with local hyperplasias and adenomas; absence of histologic castration changes) with those after castration (hypertrophy of the gland, increased basophils, and Signet-ring cells) shows that these changes are not similar.

If, however, considerable atrophic or degenerative changes develop in the testes, the castration changes are bound to appear in the hypophysis and in this way they should complicate the aging processes.

Thymus

The aging changes in the thymus and those after castration have been described by several authors and were summarised in a previous paper (85). Gradual atrophy of the thymus develops with aging, until in senility only scattered nests of thymic cells remain embedded in a great mass of fat tissue and a lesser amount of fibrous tissue. However, the occasional presence of mitotic figures and the proliferation of Hassal's bodies in the senile thymus apparently indicate that this organ is still functioning in old age.

On the contrary, after castration there is a considerable delay in the thymic involution. Nevertheless the process of aging, namely the atrophic changes, in time overcomes the castration delay in the involution of the thymus. In the castrated rat, at the age of about 1 year, the aging atrophy of the thymus approaches that of the normal intact rats.

This gradual atrophy of the thymic parenchyma, both of the thymocytes and thymic epithelial cells, is well indicated by histologic examination and the changes in the weight of this organ (tables 1-4). However, the effects of aging and that of castration on the thymus are basically different.

Liver

Effect of Aging.—Andrew, Brown, and Johnson (4) found large hepatic cells, with large nuclei and many nucleoli, in the livers of old mice, which they did not observe in the young animals. They recorded similar changes in human livers and also some infiltrations by lymphocytes and fibrous tissue in the periportal areas. Bucher and Glinos (9) observed that older rats, when compared with young animals, had larger hepatic cells and nuclei, but a smaller number of binucleated cells (about 35 per cent as compared with 58 per cent in young rats). They also found hyperplasias of the bile ducts with cystic dilatations and cellular infiltrations in the periportal areas. These authors recorded emaciation in their older rats. They considered this change to be a feature of old age.

In the present experiments, in the rats about 1 year old and the senescent animals, the hepatic cells were much larger than in the young rat (table 7, cols. 1, 3, 5, 7, 9, $P < 0.001$), confirming the above mentioned investigations; on the contrary, the average size of the nuclei ($P = 0.01$) and the percentage of large nuclei were smaller in the adult rats than in the young animals, while in the senescent rats this difference was significant ($P < 0.02$) only in the percentage of large nuclei (5.5 per cent as compared with 12 per cent in the young rats). Therefore the ratio of the nucleus to cytoplasm in adult and senescent rats (table 7, $P < 0.001$) was considerably smaller than that in the young animals. Our rats were healthy animals.

When, however, a certain strain of rats, which always suffers from severe chronic pneumonia in old age, was investigated, a few very large nuclei were found scattered among the majority of the normal sized nuclei in the livers of these senescent animals. Thus, in these "pneumonia" rats and in the emaciated senescent rats of Bucher and Glinos the presence of large nuclei in the livers of old rats might have some connection with the ill condition of the animals and not with old age.

TABLE 7. HEPATIC CELLS IN NORMAL AND CASTRATED RATS.

Age Groups (Days)	Average Weight of Paper Replica (Mg.)						Percentage of			
	Cytoplasm		Nucleus		Ratio Nucleus to Cytoplasm		Large Cells		Bi-Nucleated Cells	
	Normal	Castrated	Normal	Castrated	Normal	Castrated	Normal	Castrated	Normal	Castrated
39–55	7.18	—	1.20	—	1:6.04	—	8.4	—	5.3	—
360	10.09	6.97	1.08	1.07	1:9.32	1:6.58	13.8	6.4	4.9	5.2
635	11.79	8.66	1.16	1.08	1:10.18	1:8.03	18.2	9.1	2.7	3.7

In each group the cells and nuclei of 6 rats were measured.

A decrease of bi-nucleated cells, although present in senescent rats (table 7), was not statistically significant ($P > 0.05$).

A great decrease in the number of mitoses (table 5), the appearance of round cell infiltrations (in about 23 to 26 per cent of the rats), and the occurrence of bile-duct hyperplasias (in about 54 per cent of the rats) were also recorded. These hyperplasias were described in detail and illustrated in our previous papers (47, 57, 59).

Effects of Castration.—Previously (43) it was found that the number of basophilic granules was decreased in the hepatic cells of castrated rats.

In our present experiments (table 7, cols. 2, 4, 6, 8, 10), the average size of the hepatic cells ($P < 0.001$) and the percentage of large cells ($P < 0.01$) were smaller in the castrates than in the normal controls.

Actually, as judged by the size of the cells (table 7, col. 2 as compared with col. 1), there was no compensatory "aging" hypertrophy of the hepatic cells in the adult rats 360 days old. In these rats the effect of castration was of long duration, because they were castrated at an early age; and even in the rats 635 days old, castrated in senescence, this hypertrophy was considerably smaller than in the normal controls. No significant difference in the size of the nuclei was observed between the normal rats and the castrates of the same age (table 7); but in the adult and in the senescent castrates the average size of the nuclei ($P < 0.05$ — 0.01) and percentage of large nuclei were smaller than those in the young rats.

The ratio, however, of the nucleus to cytoplasm was larger in the castrates than in the normal rats because of the atrophic decrease of cytoplasm in the former animals. This indicates that in pathologic conditions (e. g., castration) this ratio cannot be considered as a test of aging.

The percentage of the rats with cellular infiltrations (about 33 per cent) seemed to be slightly increased, while the bile duct hyperplasias (in about 31 per cent of the rats) were decreased. However, investigation of a larger number of rats is necessary before considering this difference in the pathologic changes to be conclusive.

Mitoses were decreased in senescent castrated rats to about the same low level as in the normal rats (table 5). Thus the decreased weight of the liver (tables 2-4) in the castrates can be explained chiefly by the smaller size of the hepatic cells.

Comparison of the aging and castration changes in the liver cells definitely indicates that castration hastens aging processes in this organ chiefly by accelerating involution changes in the hepatic cells (as was also found in the case of the relative weights of the liver).

Kidneys

In the cases of simple atrophy of senile human kidneys, as described by Kaufman (39, p. 1311), diminution in size of the epithelium of the convoluted and straight tubules, smaller or totally obliterated by hyaline degeneration glomeruli, and a slight increase of interstitial tissue around the atrophic renal elements were found. Kaufman does not consider that the round cell infiltrations belong to pure senile changes in the kidneys.

Oliver (79, 80), on the contrary, on the basis of his own investigations, thinks that senile renal atrophy in man is a secondary process, being the result of arteriosclerosis of the renal arteries, a change which is a part of general arteriosclerosis in old age. In his opinion, if a primary simple atrophy of senile kidneys exists, it is obscured and overshadowed by secondary tissue changes produced by renal arteriosclerosis. He emphasises, however, that in the dog arteriosclerosis is uncommon and that in the rat senile changes in the kidneys do not belong to the group of arteriosclerotic atrophies.

Also Wilens and Sproul (100) were unable to explain the senile atrophy of the rat kidneys by arteriosclerosis, which was only found in this animal in exceptional cases. In Councilman's (14) opinion, both primary simple, and secondary arteriosclerotic, senile atrophies of the kidneys occur in man. He found the arteriosclerotic type in about three-quarters of his cases.

Arataki (5) and Moore and Hellman (75) concentrated their research on aging changes in the renal glomeruli of rats. Arataki found about 10,700 glomeruli at birth, about 31,000 at maturity, and about 20,000 in senescence. The average diameter of glomeruli in male rats was 62μ at birth and 124μ at the age of 500 days. Moore and Hellman also found an increase in the size of the glomeruli with aging, but the range of the glomerular sizes in older rats was greater than in young animals. Apparently in older animals, the smaller sizes indicate more pronounced atrophic changes in some glomeruli, while the larger sizes express a compensatory hypertrophy of the remaining normal glomeruli.

Saxton and Kimball (87) consider chronic nephrosis as a senile disease in the rats of their strain. They did not find nephrosis up to the age of about 299 days, but recorded it in about 9.4 per cent in rats aged 300 to 399 days and in about 37.5 per cent at the age of 500 to 650 days. High protein diet increased incidence of nephrosis, while in retarded rats Saxton (86) found nephrosis to be exceptional.

In the present experiments, the measurements (table 8) have shown that in older

TABLE 8. CONVOLUTED TUBULES AND PATHOLOGIC CHANGES IN KIDNEYS IN NORMAL AND CASTRATED RATS.

Age	Average Weight of Paper Replica (Mg.) of						Percentage of Rats with			
	Tubule without Lumen		Tubular Lumen		Nucleus		Round Cell Infiltrations		Oedema of Glomeruli and Casts	
	Normal	Castrated	Normal	Castrated	Normal	Castrated	Normal	Castrated	Normal	Castrated
55	7.19	—	0.85	—	0.66	—	0	—	0	—
360	9.67	7.49	1.24	1.00	0.62	0.52	42	59	16	18
635	9.67	8.81	1.28	1.19	0.67	0.67	70	62	15	15

In normal rats aged 55, 360, and 635 days the measurements were made in 10, 10, and 6 animals, respectively; in castrates aged 360 and 635 days in 8 and 7 rats, respectively.

rats the cells of the renal tubules ($P < 0.001$) and the tubular lumen ($P < 0.001$) are larger, while the number of mitoses (table 5) is much decreased. In the rats of M strain (table 8) the nuclei were slightly smaller ($P < 0.05$) in the adult animals 360 days old, but their size in senescent rats returned to that in young rats. In the strain R (table 1) there was also no significant difference between the size of the nuclei in the young animals aged 29 days (0.64 mg.) and that of the senescent animals aged 480 days (0.67 mg.). Therefore the senescent involution of the kidneys should be explained by hypoplasia (decrease in number) of the renal cells, and not by their atrophy, i. e., by changes similar to those observed in the renal glomeruli.

Pathologic renal lesions occurred in our rats from the age of 360 to 635 days in the form of nests of round cell infiltrations, oedema in glomeruli and hyaline casts in the tubules (table 8). Cell infiltrations were present in the majority (about 70 per cent) of senescent rats. They were, however, very small in size and number, two or three of them occurring in a cross-section of the kidney, as was also the case with oedema of the glomeruli. When the glomeruli were affected, the casts were also present. No sclerosis of the renal arteries was found.

The pathologic lesions in our rats never reached the degree of severe nephrosis as described by Saxton and Kimball in their old rats. Our diet for rats, however, contained less protein than that used by these investigators.

Effect of Castration.—Previously (60), using the same method of measurement as in the present experiments, a statistically significant decrease of the renal tubules was recorded in castrated rats. Noble and Greenberg (77) found smaller renal tubules in castrated chameleons.

In the present experiments (table 8), the castrated rats had smaller cells in the renal tubules ($P < 0.02 — 0.001$) than normal rats, and smaller lumina. The nuclei were also smaller ($P < 0.001$), but only in the group of the early castrated rats at age 360 days. In this adult group the compensatory hypertrophy of the renal cells was not observed, but it was definite in the senescent castrated rats (at the age of 635 days), although less pronounced than in the normal rats. Therefore, in both the nuclei and cytoplasm the effect of early castration was stronger than that of the late castration. The number of mitoses (table 5), and the occurrence and development of pathologic lesions (table 8) were about the same as in the normal control rats. Thus, the smaller tubular cells can explain the small kidneys of the castrates.

Comparison of the aging changes with the castration changes in the renal cells demonstrates that a decreased compensatory hypertrophy of the renal cells in the castrates hastens the aging involution of their kidneys.

Spleen

As was found in senescent female rats (59) in senescent males the numbers of mitoses and of giant cells were smaller than in young rats (table 5). No other definite changes were found. Andrew (2), however, in rats older than our animals, found considerably larger changes which were reviewed in our previous paper (59).

After castration about the same decrease in mitoses and giant cells was found as in control normal senescent rats (table 5) but no other changes.

Heart

Effects of Aging.—A simple atrophy of the heart, with atrophic myofibres, was found by Kaufman (39) and Warthin (99) in old persons who had none of the usual senile degenerative diseases. The pigment (lipochrome) accumulates continuously with aging in the cardiac myofibres. In the hearts of old persons it is present in considerable amounts, being chiefly responsible for the colour of the "brown atrophic" hearts (Cohn, 11).

Jayne (38) described an acid-fast pigment chemically similar to hemofuchsin which also

increases progressively with age. Wilens and Sproul (100) and Saxton (86) recorded myocardial fibrosis in old rats. Saxton found it in about 15 per cent of old rats aged 401 to 600 days, and in about 50 per cent of rats aged 801 to 1000 days. He could not find sclerosis of coronary vessels in these rats, which suggested a primary myocardial degeneration with subsequent replacement of the affected areas by fibrous tissue.

Wilens and Sproul, however, found some changes in the coronary vessels: fibrosis of the media and thickening of the arterial wall, and some calcification in about 3.5 per cent of his cases. Barnes (6), using the roentgenographic method, observed increased calcium deposition in the heart of rats with aging: in 20 per cent at the age of 300 to 400 days, 50 per cent at 800 to 900 days, and 86 per cent at later ages.

Hummel and Barnes (35), however, do not consider that age is a primary factor in calcification of the aorta, since it was absent in some rats aged 898 to 1160 days.

In female senescent rats, aged 22 to 27 months, we found (59) a definite cardiac hypoplasia, but histologically no such pathologic changes as myocardial fibrosis or coronary sclerosis were seen. In the present experiments (table 9) a greater percentage of large cardiac myofibres was found in older rats aged 360 to 675 days than in young animals ($P < 0.001$). As pathologic changes only a few and tiny nests of round cell infiltrations of the myocardium were found in about 17 to 29 per cent of normal rats at the age of 635 to 675 days, but these infiltrations were absent at the age of 360 days and also in the young animals. No fibrosis of the myocardium was observed.

Effects of Castration.—In our previous experiments (51) a less reliable method of measurement than in the present experiments was used. Nevertheless in castrated rats the average size of myofibres was found to be smaller by about 21 per cent than in normal controls. In the present experiments (table 9) a definite decrease of large cardiac fibres was again observed in the castrates ($P < 0.02$ — 0.01) as compared with normal animals. The round cell infiltrations occurred in about the same percentage, but at the age of 360 days they were recorded in about 12 per cent of the castrates, while at this age none were observed in normal rats. Previously (51), we tested the strength of the isolated hearts of castrated and normal male rats. In castrates the cardiac strength was decreased by about 11.6 per cent when no extra work was required, and by about 18.3 per cent when weights of 10 and 15 Gm. were attached to the lever pulled by the heart's contractions.

Table 9. Large Myofibres and Round Cell Infiltrations in Heart of Normal and Castrated Rats.

Age in Days	Percentage of			
	Large Myofibres		Rats with Cell Infiltrations	
	Normal	Castrated	Normal	Castrated
55	9.2	—	0	—
360	13.7	11.0	0	12
605	18.9	13.7	16.7	14.3
635	15.1	13.2	28.6	33.3

In normal rats aged 55, 360, 605, and 635 days the counts of large myofibres were in 10, 19, 7, and 6 rats, respectively; in castrated rats aged 360, 605, and 635 days in 15, 6, and 7 rats, respectively.

Thus, the decrease in relative weights of the heart and in the percentage of large cardiac myofibres and functional tests on isolated hearts definitely demonstrate that the heart of castrates is weaker than that of the normal animals.

These findings indicate that castration accelerates the processes of aging in this vital organ.

Pancreas

The aging changes in the pancreas of rats and man were described and the literature on the subject reviewed by Andrew (1). He found more or less pronounced atrophic and

degenerative changes both in exocrine tissue and in the islands of Langerhans and also proliferation of the small pancreatic ducts with formation of cysts or solid nests.

In the previous experiments on senescent females (59) and the present on senescent males no definite degenerative changes were found in the pancreatic tissue of our rats.

Metaplastic structures, originating from exocrine acini of the pancreas, were very rarely observed in both our investigations, only in 1 rat out of 17 females and in 1 rat out of 26 males. These metaplasias, their origin from acinar tissue, pancreatic ducts, and the islands of Langerhans, and their increased incidence and development in senescent rats treated with hormones, were described fully elsewhere (47, 57-59). No definite differences were noted in the pancreas of castrated animals as compared with that in the normal controls. No measurements of the cells and nuclei were made.

Skeletal Muscles

Effect of Aging.—The review of the literature on the subject was made by Todd (94). He concludes that with aging the connective tissue, in particular collagenous and elastic fibres, increases in the muscles. The simple atrophy of the muscular tissue in old age is also well established. Lowry and Hastings (65), however, rightly emphasise that is remains to be investigated how much of this atrophy of muscular tissue is due to actual loss of individual myofibres and how much to a decrease in their size.

Our measurements of cardiac myofibres in the present experiments, and those of Buccianti and Luria (8) and Yannet and Darrow (105) of skeletal muscles, indicate an increase in the number of hypertrophic myofibres in senescence. Therefore senescent atrophy of mucles apparently can be explained chiefly by degeneration, with consequent loss, of individual myofibres. In order to compensate for this loss, a hypertrophy of some remaining myofibres develops, but it fails to produce complete compensation. The biochemical investigations of Simms and Stolman (88) of human muscles and Lowry and Hastings (66) of rat muscles show that in old age the relative proportion of the intracellular mass of the muscles decreases, while that of the extracellular compartment, in particular its fluid, collagen and elastin, increases. These data confirm the results of anatomic studies, namely that senile muscles become atrophic.

Effect of Castration.—Engel (22) found that the leg muscles of castrated mice, both in actual and relative weight, weighed less than in normal animals. Caridroit and Szuman (10) demonstrated that the size of myofibres was decreased and the amount of interstitial tissue increased in the muscles of capons. Jasienski (37) investigated castration changes in the muscles of cattle, rabbits, guinea pigs, cocks, and frogs. Both macro- and microscopically it was possible to ascertain that the muscles and myofibres of castrated animals were considerably, in some cases three or four times, smaller than the normal ones, as can be judged by the illustrations given. The amount of fat and interstitial tissues were increased between the myofibres.

Papanicolau and Falk (81) observed the atrophy of the muscles in castrated guinea-pigs in which the treatment with gonadotropic hormone could not cause hypertrophy in these muscles. This hormone, however, produced their hypertrophy in normal animals. Therefore, Papanicolau concludes that the presence of the gonads is necessary for the production of muscular hypertrophy.

Slonaker (90) studied the spontaneous activity of normal and castrated rats: the number of wheel revolutions recorded for normal rats was 12,798, for castrated animals only 179. In human castrates, flabby muscles and a decrease of muscular power, the clumsy slow movements, unsuitability for hard physical work, and easy fatiguability were repeatedly recorded (32, 41, 61, 72, 83, 84, 89, 92, 97).

Thus, the anatomic and functional experiments on animals, and observations on man are in agreement.

Although further investigations on the subject are needed, all the available data definitely indicate that castration increases the aging processes in the skeletal muscles and in particular their atrophy and declining function.

Discussion

Atrophy of Organs and Changes in Cells with Aging

In the early stages of aging the atrophy of organs shows itself in a decrease of their relative weights (tables 1 and 2). This develops in senility into actual true atrophy. Since the age of our rats reached only the period of senescence, the changes produced by senility were not studied.

Within the range of ages investigated, the relative atrophy of organs was accompanied by peculiar changes in the cells. Namely, as it was demonstrated by the count of mitoses, the multiplication of the cells decreased with aging, especially in senescence (table 5). The size of the cells, however, increased with aging, i. e., they became hypertrophic. We have demonstrated this in the case of corticoadrenal, hepatic, renal, and cardiac cells, as did Buccianti and Luria (8) and Yannet and Darrow (105) in skeletal myofibres and Arataki (5) and Moore and Hellman (75) in renal glomeruli.

This compensatory hypertrophy of cytoplasm seems to be a necessary and therefore normal adjustment of the cells in the aging organism in which a vigorous multiplication of the cells is no longer needed for the growth of organs and tissues. In the aging organism the growth suppressing mechanism predominates over the growth promoting mechanism.

In the present experiments (tables 6, 7, 8) it was found that as compared with and in contrast to the hypertrophy of cytoplasm, the size of the nuclei in the liver, kidneys, and adrenals either had not changed with aging, or if it had, then only slightly. This small change, however, was constant and in some cases statistically significant in one group. Namely, in the adult rats aged 360 days the nuclei were smaller than those in the young animals in the liver ($P = 0.01$), kidneys ($P < 0.05$), and adrenals ($P < 0.2$). It is also noteworthy that in the senescent rats the nuclei became again of about the same size as that observed in the young rats. The same changes, varying with similar ages, were observed by Dawbarn in mice (18).

Hence, in the aging organism the hypertrophy of cytoplasm without considerable changes in the size of the nuclei seems to be a natural process in the aging cells.

Therefore, the ratio of nuclear mass to cytoplasm decreases with aging. Minot (73) first drew attention to this important fact. He postulated (p. 250) that senescence depends on the increase of cytoplasm and differentiation of the cells, while rejuvenation depends on the increase of the nucleus. Conklin (12), however, did not agree with Minot. A detailed research on the lines suggested by Minot's theory is important, since the nucleus is the most essential and vital organ for the cell and its functions.

The decrease of the nucleo-cytoplasmic ratio was confirmed by the histologic measurements of Eycleshymer (23), and by Dawbarn (18) who used chemical estimation of nuclear and cytoplasmic nitrogens.

The data obtained by previous investigators and our own results on the subject suggest the following theory of the mechanism, which might be instrumental in producing relative atrophy of organs in senescence, and later, in senility, their true atrophy. This theory resembles that of Minot.

A continuous process of natural wear and tear produces degeneration and loss of some cells in the living organs and tissues. In the young organism these lost cells are replaced chiefly by hyperplasia (i. e., by the multiplication of cells). In old age most of them are not replaced by new ones. Instead, the remaining normal cells become considerably hypertrophied, while their nuclei change slightly or not at all. In this way the nucleo-cytoplasmic ratio decreases. Cellular hypertrophy, however, is not sufficient to bring the relative size

and weight of the organs up to the level present in younger ages. Hence the organs become atrophied in their total size and weight, but not in the size of the cells. If the nucleus is the most important and vital organ of the cell, then the decrease of the nuclear mass per unit of cytoplasm in the aging organism might be responsible, at least partly, for the diminution of the functional capacity of the cells and for their aging decline.

When, however, in old individuals large parts of organs are removed by operation or destroyed by various causes, the organ regeneration proceeds both by multiplication and hypertrophy of the cells, but this regeneration is considerably slower in old age than in young age (5a, 9, 68, 78).

Do changes in the nucleo-cytoplasmic ratio indicate the rate of aging in all cases?

If in the aging organism some morbid cause produces atrophic changes in the cytoplasm without similarly affecting the nucleus, the nucleo-cytoplasmic ratio would increase. In such cases, if this increase is taken as a test of rejuvenation, a definitely pathologic change in the cell would be defined as rejuvenative. Obviously such a conclusion would be wrong.

We have shown that after gonadectomy such a change in the nucleo-cytoplasmic ratio occurs in those organs of castrates which become atrophic, namely the liver and kidneys; most probably it also happens in the heart and skeletal muscles, although only the size of their cytoplasm, but not that of their nuclei, was measured.

That this is not a case of rejuvenation, but on the contrary one of decline, was demonstrated by functional tests of the heart and skeletal muscles.

A misinterpretation of a different kind will also occur when the nucleo-cytoplasmic ratio decreases due to the hypertrophy of the cytoplasm alone, produced by better feeding.

Therefore, the nucleo-cytoplasmic ratio alone cannot be used as a test for the changes in the rate of aging. It must be taken into consideration that cytoplasmic hypertrophy seems to be a normal compensatory change of the aging cell and that the increase of the aging nucleus, when it is present, is considerably less than that of cytoplasm. Any deviations from these standard changes must always be investigated. Hence, especially in the cases of aging complicated by pathologic conditions or diseases, the increased rate of aging might be indicated by the atrophic processes in the nucleus or cytoplasm, or in both, more correctly than by the changes in their ratio. Biochemical or functional tests, when used in addition, will give more definite and wider conclusions.

Pathologic changes in organs with aging

In some of our senescent animals, but not in all of them, the following pathologic changes were observed: few in number and very small nests of round cell infiltrations in the liver, kidneys, and heart; mild "syncytial" degeneration in the adrenal cortex; and an increased amount of fibrous tissue, which when present in exceptional degree may develop into sclerosis, in the parathyroids.

However, the most noteworthy change in senescent animals was the appearance of small nests of metaplastic or hyperplastic cells in various organs. Through gradual intermediate stages some of them developed into adenoma-like structures and very few into true adenomas.

This adenomagenic effect of aging, observed in the present and previous experiments, was described in detail elsewhere (47, 57, 58, 59).

Deficiencies and Causes of Aging

Previously (46), the causes producing aging and its final stage, senility, were discussed in detail.

It was shown that the old age of the present day is a premature and pathologic condition, complicated by more or less numerous so-called degenerative diseases.

Basic Primary Causes of Aging.—So far the normal, physiologic old age and the normal span of life are unknown; nor are the basic

primary causes of aging known. These causes are essential and unavoidable in every case of old age. They are instrumental in producing the processes of pure physiologic aging and senility. And this is practically all that gerontology can say at present about the basic causes.

Secondary Causes of Aging.—On the contrary, there is some information about several secondary causes of aging, although scientifically they have been investigated insufficiently if at all. They are defined as secondary causes because even now they do not occur in all cases of the abnormal old age of the present day, and therefore they are not the necessary and unavoidable features of old age. Tentatively they can be subdivided into two groups.

Group I includes all the causative factors producing changes, some of which are similar to those present in aging. This group includes deficiencies in any hormone or any physiologically important compound (e. g., vitamins, protenic substances, etc.), or in some physiologic functions; probably autointoxications also belong to this group.

Obviously all these causative factors can accelerate and intensify the processes of aging because in such cases the additive similar effects of two causes are operating on the target organs and functions, namely, aging itself and, e. g., deficiency of hormones.

In the previous sections of this paper it has been shown that both aging and castration produce a number of similar changes, namely, hypoplastic or atrophic changes in the liver, kidneys, heart, and skeletal muscles; decrease of the functional capacity of the heart and skeletal muscles; also they decrease spontaneous activity, fat metabolism and probably the nitrogen content of the tissues; in some cases of aging there are atrophic changes in the sex organs and more or less depressed activity of the thyroid, changes which are always present in castrates.

Previously (44) we have reviewed all the data which demonstrate that, both in old age and after castration, similar mental changes develop in man, namely, a tendency to depression and apathy, unwillingness to do mental or physical work, and emotional instability. Also, in both processes, the skin becomes pale, non-elastic, with wrinkles and folds and flabby subcutaneous tissue.

Therefore, when it occurs, deficiency of sex hormones accelerates and intensifies the above mentioned processes of aging, and becomes one of the important secondary causes of aging.

Sometimes the aging effect of such a secondary factor is so obvious and severe that it has been considered by many investigators as one of the primary causes. It was so in deficiencies of sex hormones, also in thyroid hormone deficiency.

In favour of "the thyroid theory of aging" the following facts were quoted (95, 34, 64, 30, 39a, 61a): 1) the atrophic or degenerative thyroids, comparatively often found in senile animals and human beings; 2) the similarity of senescent and hypothyroidal changes, namely, lowered metabolism, tendency to obesity, pale non-elastic skin, atrophic brittle nails, early graying, and, in some cases, falling out of hair, flabby weak muscles, easy fatiguability, apathy and mental depression, easy chilling, and rheumatoid-like pains in the limbs, lumbar, and sacral regions; 3) the favourable results after the treatment of such senile cases with thyroid hormone; 4) the suggested correlation between hypothyroidism and the development of arteriosclerosis.

Group II includes all the accidental extraneous factors, which produce changes usually dissimilar from, and non-specific for, the processes of aging. All these factors, however, increase wear and tear and involution, general or only of one or more organs or tissues.

To this group belong infectious diseases, various extraneous intoxications, physical or mental traumas and stresses, and any diseases producing pathologic changes in various organs; for example, diphtheric lesions of the heart, toxic and dietary cirrhoses of the liver, nephritis produced by toxic substances, all of which for obvious reasons accelerate and aggravate the involuntary processes of aging in the respective organs and in the organism as a whole.

However, these causative factors, and the lesions produced by them have no connection with the natural causes of aging nor with the changes produced by aging (46).

Accidental Nature and Vicious Circles of the Secondary Causes of Aging

We have already emphasised that these causes are not operating in all cases of senescence but only in some. Therefore they are non-constant and accidental complications of old age. Future geriatrics probably will learn to prevent their appearance in many cases, and when they have appeared, to eliminate them more or less completely.

We have already shown that in senescence a comparatively good preservation of the sex organs and functions occurs in some cases, both in animals and in man. For example, such a good preservation of the sex organs, both in their weight and histology, was recorded in the senescent rats of our previous (50) and present experiments, although some relative diminution of the testes was present.

Also there might be cases of senescence in which a normal or hyperactive thyroid, and not an atrophic one, was found. This was also observed in our senescent rats.

In addition, both groups of the secondary causes, including those which produce several changes similar to the processes of aging, also produce some other changes which are specific only for the respective causes. For example, the specific enlargement of the adrenals and hypophysis and delayed involution of the thymus are typical only of castration. Histologically in the adrenals, in contrast to other organs of castrates, the aging compensatory hypertrophy of the cortical cells was more (and not less) pronounced in gonadectomised rats than that in the intact control rats; accordingly the nucleocytoplasmic ratio was decreased.

Another instance of the histologic difference between aging and castration changes is demonstrated in the liver, kidneys, heart, and skeletal muscles, namely in those organs and tissues which decrease both with aging and after castration. While with aging there is a compensatory hypertrophy of cytoplasm in the remaining healthy cells of these organs, in the castrates such a hypertrophy is absent or considerably decreased. This suggests that in such cases certain compensatory mechanisms are depressed in the castrates, while with aging there are not only regressive changes but also some progressive ones.

All the changes, which are atypical for aging, but specific only for the respective factor, produce new lesions in their target organs and functions; these new lesions cause another group of abnormal changes, and so on. In this way each secondary causative factor starts its own specific vicious circle, which further, and often gravely, complicates old age.

Summary

1. Processes of aging and the effects of deficiency of sex hormones on these processes were studied on 221 normal and 111 castrated rats, a total of 332 male animals. The results obtained were compared with those described in the previous papers of Korenchevsky and associates, and with the related observations made on animals and man by other investigators.

2. The following processes of aging were observed in these rats up to and during the period of senescence:

a. relative hypoplasia of the organs investigated (confirming our previous results), accompanied, however, by
b. considerable compensatory hypertrophy of the cytoplasm in the cells, with no, or small changes in their nuclei, which results in a decreased nucleo-cytoplasmic ratio (confirming certain observations of Minot and other investigators);
c. decrease of the number of mitoses, and therefore of the multiplication of the cells;
d. increased deposition of body fat;
e. appearance of the minute nests of hyperplastic or metaplastic cells in various organs and their development in some cases,

through gradual intermediate stages, into adenoma-like structures or (in a very few cases) true adenomas;

f. few and very small nests of round cell infiltrations in the liver, kidneys, and heart;

g. mild degenerative changes in the adrenals and kidneys and increased development of fibrous tissue in the parathyroids;

h. thus, the processes of aging in the cells are characterised not only by regressive (atrophic or degenerative) changes, but also by progressive ones, namely the physiologic compensatory hypertrophy of the cytoplasm and the pathologic development of hyperplastic cellular nests with their tendency to become tumours.

3. Some other changes of aging, observed by previous investigators, were also discussed, namely, atrophy of skeletal muscles, decreased spontaneous activity, changes of the water-content in the intra- and extra-cellular compartments of the tissues, and a small decrease in the nitrogen content of the tissues.

4. Comparatively well preserved sex organs and normal active thyroids were found in our senescent rats.

5. Several of the above mentioned changes of aging were also observed in man.

6. A possible theory of the mechanism of hypoplasia of organs with aging was suggested, based on the above mentioned changes in the aging cells. Apparently these processes, including the hypertrophy of the cytoplasm, are physiologic adjustments in the aging organism in which the growth-suppressing mechanism predominates over the growth-promoting one.

7. A certain analogy exists between the relative hypoplasia of vital organs in the aging organism and the relative decrease of nuclear mass in the aging cells.

8. However, the nucleo-cytoplasmic ratio, in particular its increase, cannot be used alone in all cases as a test of the degree and rate of aging or rejuvenating processes. For this purpose besides, or in some cases irrespective of the changes in the ratio, the regressive or progressive changes in the cytoplasm and nuclei must be considered, especially in combination with some suitable biochemical or functional tests.

9. According to the results obtained in the present experiments and those of the previous investigators, castration produces several changes which are similar to the respective processes of aging.

10. Therefore, when present, deficiency of sex hormones produces additive and intensifying effects on the similar changes in the processes of aging. In such cases this deficiency becomes one of the secondary causes of aging, accelerating the onset of senility and aggravating its course.

11. Deficiency of sex hormones is not one of the primary causes of aging since, besides producing some changes different from those in senescence (e. g., in the thymus, adrenals, and hypophysis), it is not always present in old animals and man.

12. Effects of castration performed at an early age are more pronounced than those of late castration.

13. Other secondary causes of aging, including hypothyroidism, were also discussed, defined, and tentatively classified into two groups.

14. Present day old age is a pathologic condition complicated by various pathologic secondary features of aging and so-called degenerative disease, which even now are not present in all cases of old age. Therefore they cannot belong to the features of the normal physiologic old age.

15. A comprehensive study, however, of the secondary causes and secondary processes of aging is of the greatest theoretical and practical importance.

The grant to the Oxford Gerontological Research Unit from the Nuffield Foundation and the hospitality extended to the Unit by Prof. E. G. T. Liddell in the Department of Physiology of Oxford University are gratefully acknowledged.

References

1. Andrew, W.: Senile Changes in the Pancreas of Wistar Institute Rats and of Man. *Am. J. Anat., 74:* 97-127, 1944.

2. Andrew, W.: Age Changes in the Vascular Architecture and Cell Content in the Spleens of 100 Wistar Institute Rats, Including Human Material. *Am. J. Anat., 79:* 1-74, 1946.

3. Andrew, W., and Andrew, N. V.: Senile Involution of the Thyroid Gland. *Am. J. Path., 18:* 849-863, 1942.

4. Andrew, W., Brown, H. M., and Johnson, J. B.: Senile Changes in the Liver Cells of Mouse and Man, with Special Reference to the Similarity of the Nuclear Alterations. *Am. J. Anat., 72:* 199-213, 1943.

5. Arataki, M.: On the Postnatal Growth of the Kidney, with Special Reference to the Number and Size of the Glomeruli (Albino Rat). *Am. J. Anat., 36:* 399-436, 1926.

5a. Aub, J. C.: Regeneration of the Liver in Old Age. *Transactions of the Tenth Conference on the Problems of Aging.* Josiah Macy, Jr. Foundation, New York, 1950, pp. 17-18.

6. Barnes, L. L.: The Deposition of Calcium in the Hearts and Kidneys of Rats in Relation to Age, Source of Calcium, Exercise and Diet. *Am. J. Path., 18:* 41-47, 1942.

7. Bauer, J., and Bollinger, O.: *Über idiopatische Herzvergrösserung. Festschrift für M. von Pettenkofer*, München, 1893. (Quoted by Külbs, *Ztschr. f. d. ges. exper. Med., 67:* 822, 1929).

8. Buccianti, L., and Luria, S.: Struttura dei Muscoli Voluntari dell' uomo nella Senescenza. Arch. Ital. di anat. e embryol., *33:* 110-187, 1934. Quoted by Lowry and Hastings (65) p. 751.

9. Bucher, N. L. R., and Glinos, A. D.: The Effect of Age on Regeneration of Rat Liver. *Cancer Research 10:* 324-332, 1950.

10. Caridroit et Szuman: (Rev. d'Histologie natur. appliqué, 1928) quoted by Jasienski (37) p. 533.

11. Cohn, A. E.: Cardio-vascular System and Blood. *Problems of Ageing,* 2nd Edition, edited by E. V. Cowdry, Williams and Wilkins, Baltimore, 1942, pp. 111-138.

12. Conklin, E. G.: Cell Size and Nuclear Size. *J. exper. Zool., 12:* 1-98, 1912.

13. Cooper, E. R. A.: *The Histology of the More Important Human Endocrine Organs at Various Ages.* Oxford University Press, Oxford, 1925.

14. Councilman, W. T.: The Conditions Presented in the Heart and Kidneys of Old People. *Contrib. to Med. and Biol. Res.,* dedicated to W. Osler, *2:* 918-928, 1919.

15. Cowdry, E. V.: *Problems of Ageing,* 2nd Edition. Williams and Wilkins, Baltimore, 1942.

16. Crotti, A.: *Diseases of the Thyroid, Parathyroid and Thymus.* H. Kimpton, London, 1938.

17. Curschmann, H.: *Endocrine Disorders.* Oxford University Press, London, 1929.

18. Dawbarn, M. C.: The Nucleo-Cytoplasmic Ratio of the White Mouse and its Variation with Age. *Australian J. Exper. Biol. & M. Sc., 9:* 213-226, 1932.

19. Delamere, G.: Recherches sur la Senescence de la Glande Surrenale. *Compt. rend. Soc. de Biol., 55:* 1152-1154, 1903.

20. Dogliotti, G. C., and Nutti, N. G.: Thyroid and Senescence. *Endocrinology, 19:* 289-292, 1935.

21. Donaldson, H. H.: *The Rat.* Wistar Institute, Philadelphia, 1924.

22. Engel, P.: Body and Muscle Growth in Normal and Castrated Albino Mice. *Endocrinology, 29:* 852-853, 1941.

23. Eycleshymer, A. C.: The Cytoplasmic and Nuclear Changes in the Striated Muscle Cells of Necturus. *Am. J. Anat., 3:* 285-310, 1904.

24. Frank, R. T., and Salmon, U. J.: Gonadotropic Excretion in the Male Castrate. Effect of Sex Hormones. *Proc. Soc. Exper. Biol. & Med., 34:* 804-805, 1936.

25. Furno, A.: Ricerche Anatomo-Pathologiche Intorno al Rene Atrofico Senile. *Sperimentale, Arch. biol., 63:* 99-129, 1909. Quoted by Oliver (79) pp. 306-307.

26. Gilmour, J. R., and Martin, W. J.: The Weight of the Parathyroid Glands. *J. Path. & Bact., 44:* 431-462, 1937.

27. Goldzieher, M. A.: Effects of Internal Function on Fat Metabolism and Tissue Respiration. *Endocrinology, 18:* 179-187, 1934.

28. Hall, K.: Changes in the Adrenals of Gonadectomised Male and Female Rats Produced by Prolonged Injections of Sex Hormones. *J. Path. & Bact., 51:* 75-82, 1940.

29. Hall, K., and Korenchevsky, V.: Effects of Castration and of Sexual Hormones on the Adrenals of Male Rats. *J. Physiol., 91:* 365-374, 1938.

30. Hashinger, E. H.: Hypothyroidism in the Aged. *J. Gerontol., 6: Suppl.:* 99, 1951.

31. Heller, C. G., and Myers, G. B.: The Male Climacteric, its Symptomatology, Diagnosis and Treatment. *J.A.M.A., 126:* 472-477, 1944.

32. Heller, C. G., Nelson, W. O., and Roth, A. A.: Functional Prepuberal Castration in Males. *J. Clin. Endocrinol., 3:* 573-588, 1943.

33. Henderson, W. R., and Rowlands, I. W.: The Gonadotropic Activity of the Anterior Pituitary Gland in Relation to Increased Intracranial Pressure. *Brit. M. J., 1:* 1094-1097, 1938.

34. Hertoghe, E.: De l'Hypothyroide Benigne Chronique ou Myxoedeme Fruste. *Nouv. iconogr. de la Salpêtrière, 12:* 267-311, 1899.

35. Hummel, K. P., and Barnes, L. L.: Calcification of the Aorta, Heart and Kidneys of the Albino Rat. *Am. J. Path., 14:* 121-124, 1938.

36. Hunt, T. E.: Mitotic Activity in the Anterior

Hypohysis of Female Rats of Different Age Groups and at Different Periods of Day. *Endocrinology, 32:* 334-339, 1943.

37. Jasienski, J.: Influence de la Castration sur la Musculature. *Compt. rend. Soc. de Biol., 101:* 533-537, 1929.
38. Jayne, E.: Cytochemical Studies of Age Pigments in Human Heart. *J. Gerontol., 5:* 319-325, 1950.
39. Kaufman, E.: *Pathology.* H. H. Lewis and Co., London, 1929.
39a. Kirk, E., Chieffi, M., and Kountz, W. B.: The Correlation Between Thyroid Function and the Incidence of Arteriosclerosis. *J. Gerontol., 3:* 212-217, 1949.
40. Klinefelter, H. F., Reifenstein, E. C., and Albricht, F.: Syndrome Characterized by Gynecomastia, Aspermatogenesis Without A-Leydigism and Increased Excretion of Follicle-Stimulating Hormone. *J. Clin. Endocrinol., 2:* 615-627, 1942.
41. Koch, W.: Über die russisch-rumänische Kastratensexte Skopzen. *Veröffentlichungen aus der Kriegs- und Konstitutionspathologie, 2:* 1-39, 1921.
42. Korenchevsky, V.: The Influence of Cryptorchidism and Castration on Bodyweight, Fat Deposition, the Sexual and Endocrine Organs of Male Rats. *J. Path. & Bact., 33:* 607-636, 1930.
43. Korenchevsky, V.: Sex Hormones and the Basophilic Granulation of the Liver Cells in the Rat. *J. Path. & Bact., 52:* 341-347, 1941.
44. Korenchevsky, V.: The War and the Problem of Ageing. *Ann. Eugenics, 11:* 314-332, 1942.
45. Korenchevsky, V.: Natural Relative Hypoplasia of Organs and the Process of Ageing. *J. Path. & Bact., 54:* 13-24, 1942.
46. Korenchevsky, V.: The Problem of Ageing, Basic Difficulties of Research. *Brit. M. J., i:* 66-68, 1949.
47. Korenchevsky, V.: I. Spontaneous Development of Meta-hyperplasias and Adenoma-like Structures in Senescent Rats. II. Cooperative Effects of the Processes of Ageing, and Overstimulation with Hormones in Producing Adenoma-like Structures and True Adenomas. *Acta Union. Intern. contre Cancer, 7:* 323-329, 1951.
48. Korenchevsky, V., and Dennison, M.: The Effect of Cryptorchidism and Castration on the Chemical Composition of Rats. *Biochem. J., 24:* 954-960, 1930.
49. Korenchevsky, V., and Dennison, M.: The Manifold Effects of Castration in Male Rats. *J. Path. & Bact., 38:* 231-246, 1934.
50. Korenchevsky, V., and Hall, K.: Prolonged Injections of Male Sex Hormones into Normal and Senile Male Rats. *Brit. M. J., i:* 4-8, 1939.
51. Korenchevsky, V., Hall, K., Burbank, R. C., and Cohen, J.: Hepatotrophic and Cardiotrophic Properties of Sex Hormones. *Brit. M. J., i:* 396-399, 1941.
52. Korenchevsky, V., Hall, K., and Ross, M. A.: Prolonged Administration of Sex Hormones to Castrated Rats. *Biochem. J., 33:* 213-222, 1939.
53-55. Korenchevsky, V., and Jones, V. E.: The Effects of Androsterone, Oestradiol and Thyroid Hormone on the Artificial Premature "Climacteric" of Pure Gonadal Origin Produced by Ovariectomy in Rats:
   I. Effects on Weights of Organs. *J. Gerontol., 1:* 319-335, 1946.
   II. Effects on Histologic Structure of Liver and Kidneys. *J. Gerontol., 1:* 336-344, 1946.
   III. Effects on Histologic Structure of Vagina, Uterus, Adrenals and Thyroid. *J. Gerontol., 2:* 116-136, 1947.
56. Korenchevsky, V., and Jones, V. E.: The Effects of Progesterone, Oestradiol, Thyroid Hormone, and Androsterone on the Artificial Premature Climacteric of Pure Gonadal Origin Produced by Ovariectomy in Rats. *J. Gerontol., 3:* 21-39, 1948.
57. Korenchevsky, V., and Paris, S. K.: Cooperative Effects of Endocrinological Factors and Processes of Ageing in Producing Adenoma-like Structures in Rats. *Cancer, 3:* 903-922, 1950.
58. Korenchevsky, V., and Paris, S. K.: Metaplasias and Adenomas in Senescent Male Rats Treated with Hormones. *Unpublished.*
59. Korenchevsky, V., Paris, S. K., and Benjamin, B.: Treatment of Senescence in Female Rats with Sex and Thyroid Hormones. *J. Gerontol., 5:* 120-157, 1950.
60. Korenchevsky, V., and Ross, M. A.: Kidneys and Sex Hormones. *Brit. M. J., i:* 645-648, 1940.
61. Korsakow, W.: Die Eunuchen in Peking. *Deutsche med. Wchnschr., 24:* 338-340, 1898.
61a. Kountz, W. B.: *Thyroid Function and Its Possible Role in Vascular Degeneration.* C. C. Thomas, Springfield, Illinois, 1951.
62. Lawless, J. J.: Castration in the Rat with or without Removal of the Epidymis. *Anat. Rec., 66:* 465-473, 1936.
63. Loeb, L.: Hormones and the Process of Ageing. *Harvey Lectures, 36:* 228-250, 1940-1941.
64. Lorand, A.: *Old Age Deferred.* 5th Edition. F. A. Davis Co., Philadelphia, 1922.
65. Lowry, O. H., and Hastings, A. B.: Histochemical Changes in Ageing. In *Problems of Ageing,* 2nd Edition, edited by E. V. Cowdry, Williams and Wilkins, Baltimore, 1942, pp. 728-755.
66. Lowry, O. H., Hastings, A. B., Hull, T. Z., and Brown, A. N.: Histochemical Changes Associ-

ated with Aging. II. Skeletal and Cardiac Muscle in the Rat. *J. Biol. Chem., 143:* 271-280, 1942.

67. Lüthje, H.: Ueber die Castration und ihre Folgen. *Arch. f. exper. Path. u. Pharmakol., 48:* 184-222, 1902; *50:* 268-272, 1903.
68. Marshak, A., and Byron, R. L.: The Use of Regenerating Liver as a Method of Assay. *Proc. Soc. Exper. Biol. & Med., 59:* 200-202, 1945.
69. Masui, K., and Tamura, Y.: The Effect of Gonadectomy on the Weight of the Kidney, Thymus and Spleen. *Brit. J. exper. Biol., 3:* 207-223, 1926.
70. McCay, C. M.: Chemical Aspects of Ageing and the Effect of Diet upon Ageing. In *Problems of Ageing,* 2nd Edition, edited by E. V. Cowdry, Williams and Wilkins, Baltimore, 1942, pp. 681-727.
71. Merjeievsky, G., and Okunev, N.: Unpublished. Quoted by Korenchevsky (42) p. 610.
72. Merschejewsky, W. O.: Einfluss der Verschneidung auf die Entwickelung des männlichen Organismus. In Pelikan, *Gerichtlich-Medicinische Untersuchungen über das Skopzenthum in Russland,* J. Ricker, Giessen, 1876, pp. 15-22.
73. Minot, C. S.: *The Problem of Age, Growth and Death.* J. Murray, London, 1908.
74. Moore, R. A.: Male Secondary Sexual Organs. In *Problems of Ageing,* 2nd Edition, edited by E. V. Cowdry, Williams and Wilkins, Baltimore, 1942, pp. 495-517.
75. Moore, R. A., and Hellman, L. M.: The Effect of Unilateral Nephrectomy on the Senile Atrophy of the Kidney of the White Rat. *J. exper. Med., 51:* 51-57, 1930.
76. Mustacchi, P. O., and Lowenhaupt, E.: Senile Changes in the Histologic Structure of the Thyroid Gland. *Geriatrics, 5:* 268-273, 1950.
77. Noble, G. K., and Greenberg, B.: Testosterone Propionate, a Bisexual Hormone in the American Chameleon. *Proc. Soc. exper. Biol. & Med., 44:* 460-462, 1940.
78. Norris, J. L., Blanchard, J., and Povolny, C.: Regeneration of Rat Liver at Different Ages. *Arch. Path., 34:* 208-217, 1942.
79. Oliver, J. R.: Urinary System. In *Problems of Ageing,* 2nd Edition, edited by E. V. Cowdry, Williams and Wilkins, Baltimore, 1952, pp. 302-321.
80. Oliver, J.: Principal Anatomic Changes with Normal Aging. In *Geriatric Medicine,* edited by E. J. Stieglitz, W. B. Saunders Co., Philadelphia, 1943, pp. 72-98.
81. Papanicolau, G. N., and Falk, E. A.: General Muscular Hypertrophy Produced by Androgenic Hormone. *Science, 87:* 238-239, 1938.
82. Parsons, R. J.: The Pituitary Gland and Its Pathological Processes. Medical Papers dedicated to H. A. Christian. Waverly Press Inc., Boston, 1936.
83. Pelikan, E.: *Gerichtlich-Medicinische Untersuchungen über das Skopzenthum in Russland.* J. Ricker, Giessen, 1876.
84. Pittard, E.: *La Castration chez l'Homme.* Masson and Co., Paris, 1934.
85. Ross, M. A., and Korenchevsky, V.: The Thymus of the Rat, and the Sex Hormones. *J. Path. & Bact., 52:* 349-360, 1941.
86. Saxton, J. A.: Nutrition and Growth and Their Influence on Longevity in Rats. *Biol. Symposia, 11:* 177-196, 1945.
87. Saxton, J. A., Jr., and Kimball, G. C.: Relation of Nephrosis and Other Diseases of Albino Rats to Age and to Modifications of Diet. *Arch. Path., 32:* 951-965, 1941.
88. Simms, H. S., and Stolman, A.: Changes in Human Tissue Electrolytes in Senescence. *Science, 86:* 269-270, 1937.
89. Simonson, E., Kearns, W. M., and Enzer, N.: Effect of Oral Administration of Methyltestosterone on Fatigue in Eunuchoids and Castrates. *Endocrinology, 28:* 506-512, 1941.
90. Slonaker, J. R.: The Effect of Excision of Different Sexual Organs on the Development, Growth and Longevity of the Albino Rat. *Am. J. Physiol., 93:* 307-317, 1930.
91. Smith, R. D., and Starkey, W. F.: Histological and Quantitative Study of Age Changes in the Thyroid of the Mouse. *Endocrinology, 27:* 621-627, 1940.
92. Tandler, J., and Grosz, S.: *Die biologischen Grundlagen der sekundären Geschlechtscharaktere.* J. Springer, Berlin, 1913.
93. Tang, Y. Z.: Sex Difference in Growth in Gonadectomized Albino Rats. *Anat. Rec., 80:* 13-32, 1941.
94. Todd, T. W.: Skeleton and Locomotor System. In *Problems of Ageing,* 2nd Edition, edited by E. V. Cowdry, William and Wilkins, Baltimore, 1942, pp. 322-365.
95. Vermehren, —.: *Studier over Myxoedemet.* Copenhagen, 1895. Quoted by Lorand (64) p. 93.
96. Visscher, M. B., and King, J. T.: Chemical Studies of the Whole Mouse Carcass in Relation to Age and Caloric Restriction. *J. Gerontol., 6: Suppl.:* 164, 1951.
97. Wagenseil, F.: Chinesische Eunuchen. *Ztschr. f. Morphol. u. Anthropol., 32:* 415-468, 1933.
98. Walter, F., and Addis, T.: Organ Work and Organ Weight. *J. Exper. Med., 69:* 467-483, 1939.
99. Warthin, A. S.: *Old Age.* P. B. Hoeber Inc., New York, 1930.

100. Wilens, S. L., and Sproul, E. E.: Spontaneous Cardiovascular Diseases in Rat. I. Lesions of the Heart. *Am. J. Path., 14:* 177-201, 1938. II. Lesions of the Vascular System. *Am. J. Path., 14:* 201-217, 1938.
101. Witschi, E., and Riley, G. M.: Quantitative Studies on the Hormones of Human Pituitaries. *Endocrinology, 26:* 565-576, 1940.
102. Wolfe, J. M.: Effects of Testosterone Propionate on the Structure of the Anterior Pituitaries of Old Male Rats. *Endocrinology, 29:* 969-974, 1941.
103. Wolfe, J. M., Bryan, W. R., and Wright, A. W.: Observations on Histologic Structure of Anterior Pituitaries of Old Female Rats. *Proc. Soc. Exper. Biol. & Med., 38:* 80-82, 1938.
104. Wolfe, J. M., Bryan, W. R., and Wright, A. W.: Histologic Observations on the Anterior Pituitaries of Old Rats, with Particular Reference to the Spontaneous Appearance of Pituitary Adenomata. *Am. J. Cancer, 36:* 352-372, 1938.
105. Yannet, H., and Darrow, D. C.: The Effect of Growth on the Distribution of Water and Electrolytes in Brain, Liver and Muscle. *J. Biol. Chem., 123:* 295-305, 1938.
106. Yeakel, E. H.: Changes with Age in the Adrenal Glands of Wistar Albino and Gray Norway Rats. *Anat. Rec., 96:* 525, 1946.
107. Yeakel, E. H.: Medullary Hyperplasia of the Adrenal Gland in Aged Wistar Albino and Gray Norway Rats. *Arch. Path., 44:* 71-77, 1947.
108. Yeakel, H., and Farris, J.: Changes with Age in the Weight of the Liver in Wistar Albino Rats. *Anat. Rec., 97:* 377-378, 1947.

Submitted for publication February 14, 1952

The senior author's address is:

Dr. V. Korenchevsky

Gerontological Research Unit

c/o Department of Physiology, Oxford University

Oxford, England

Long Range Sex Steroid Replacement - Target Organ Regeneration

WILLIAM H. MASTERS

During the past six years, the Department of Obstetrics and Gynecology of Washington University has attempted to evaluate the effects of long maintained sex steroid replacement on the aged female. Previous publications have described in detail the various steroid replacement patterns used in the multiple individual projects under consideration. For the first time sufficient autopsy material is now available for adequate evaluation of the effects of the long continued sex steroid therapy upon the principal target organs—the vagina, uterus, ovary, and breast.

Material and Methods

All patients used during the experimental work were over the age of 60 years and were at least ten years past their actual menopause. Original estrogen stimulation has always been necessary in order to return to the corpus uteri a form of its functioning capacity—withdrawal bleeding. This phenomenon will not occur in the senile uterus under the sole stimulation of either progesterone (5) or testosterone (6). Once the senile uterus had responded to estrogen stimulation to a degree sufficient to allow withdrawal bleeding, the patient was placed on a basic estrogen maintenance of 1 mg. of estradiol benzoate given intramuscularly twice weekly. This maintenance therapy was in all cases continued indefinitely. In the particular individuals under present consideration "indefinitely" may be precisely defined as from the moment of onset of the individual research projects to the death of the particular subject. Elapsed time under therapy for the patients to be reported has thus varied from three and one-half to five years.

Estrogen break-through bleeding has been avoided in the patients under therapy by any one of four different methods: 1) cyclic progesterone exhibition and deprivation with resultant withdrawal bleeding; 2) cyclic estrogen withdrawal with resultant breakdown and slough; 3) cyclic testosterone exhibition and deprivation with resultant withdrawal bleeding; 4) concurrent testosterone and estrogen exhibition with resultant endometrial repression sufficient to avoid the break-through bleeding phenomenon.

Autopsy results are now available on 11 individuals who died while members of the various endocrine replacement groups. Future publications will deal with results demonstrable in body systems other than the target organs.

For purposes of this paper, material has been selected from the autopsies of 7 different individuals all of whom were under the influence of some manner of maintained sex steroid therapy when they died. Tissue from the vagina was obtained from an individual member of Group I (estrogen maintenance and cyclic progesterone exhibition and deprivation). Tissue sections from the uterus and ovary and breast were obtained from both Group I and Group II (cyclic estrogen withdrawal the fourth week of each lunar month). All of the individuals represented by tissue sections here had been under constant sex steroid therapy from periods ranging from three and one-half to five years at the time of their death. The therapy was maintained in each instance throughout the terminal illness, and autopsy material was obtained as quickly as possible after the death.

It is obvious that an experiment of this character cannot be controlled satisfactorily. Each patient should have been subjected to a laparotomy and satisfactory biopsies obtained from the uterus, ovary, and breast prior to the onset of the scheduled steroid therapy. Failing this, the control series can only be women

of equal age, who were subjected to bedside environment identical to the experimental subjects. All controls lived side by side with the subjects, ate the same food, underwent the same tests, had the same interests. Their "injections," however, consisted of sesame oil alone rather than the oil solution of the particular steroid under investigation. The tissues presented and marked "control" were from patients in this category who have also died from three and one-half to five years after their group isolation as control subjects. Age incidence, gravidity, and years postmenopausal met the same criteria as the subject patients.

Results

The target organ changes are both macroscopic and microscopic in nature and will be discussed in detail as each organ is considered in its entirety.

The Vagina: The vaginal changes associated with the estrogen withdrawal of aging have been well established. Davis (1) was among the first to describe these involutional changes. The atrophic senile vagina has smooth walls of a glistening pink translucency. The cavity is reduced in size, fornices slowly obliterated, and the vagina becomes tubular in character. The pH of the vagina is either alkaline or slightly on the acid side. Microscopically, the layers of epithelial cells decrease in depth and size until the basal cell layer with its pyknotic dark nuclei is easily demonstrated by smear or biopsy.

The result of estrogen replacement on the aged vagina is beautifully illustrated by Hamblen (3). The organ increases in size. The rugal pattern returns and the gradually thickening vaginal walls take on the purplish-red cast characteristic of the 20 to 40 year age group. Microscopically there is a connective tissue increase. The epithelial layer becomes thicker with marked increase in superficial cornified and precornified cells. There is also marked basal cell activity. Figures 1 and 2 show the control and stimulated sections from aged vaginas. Note that the stimulated section (fig. 2) could easily be confused with a biopsy taken from a woman in the 20 to 40 year age group. The marked increase in cornified layers of the epithelium and in the connective tissue content of the dermal tissues are immediately apparent when compared to the control section (fig. 1). There are no constant or well defined blood vessel changes in the vaginal sections taken from stimulated patients.

The Uterus: The gross changes in the senile uterus subsequent to estrogen withdrawal with the menopause have also been well defined. The cervix and corpus lose volume. The cervix becomes smaller, more pointed, and has a denser, more fibrous consistency than during the stimulative phase of adult life. The cervical canal shows a markedly reduced patency, and the entire uterus returns to the two to one ratio of cervical dominance over corpus which is usually encountered in the female under the age of 10 years.

With the advent of estrogen replacement in the aged female, a complete reversal of the senile cervix to corpus ratio results. This growth of the uterus will not occur under the sole influence of either progesterone or testosterone. It will occur, however, either under estrogen influence alone, or a combination of estrogen and progesterone, or estrogen and testosterone replacement. The cervical canal resumes normal patency and cervical mucous returns. The regeneration of the endometrium by different steroid combinations has been previously described (5, 6, 7).

Histologically there are major regenerative changes demonstrable in the active corpus uteri. The cervix shows a return in depth of stratified squamous epithelium at the external os and a real increase in secretory ability of the cervical glands. The connective tissue body of the cervix increases in depth and activity. There have been no real blood vessel changes noted in the cervical tissue. Nor is there any evidence of regeneration of elastic tissue despite definitive stains. It is also apparent from comparative examination of the control (fig. 3) and the stimulated section (fig. 4) that the regeneration of epithelium and connective tissue

is accompanied by increase in individual cell growth and size.

The corpus is the site of the most far reaching histologic changes. All phases of endometrial stimulation in glands, stroma, vascular bed are noted—depending, of course, upon the particular hormone dominance. The muscle fibers increase in size as water retention continues under steroid influence. The endometrial glands respond to the individual steroid dominance and can be carried through complete pseudo-menstrual cycles by proper adjustment of the normal estrogen-progesterone influence.

Some of the most interesting changes, however, are confined to the vascular system, particularly the smaller arteries and veins. Exhaustive examination of the corpus sections shows undoubted evidence of blood vessel regeneration. There is particular response in the media of these vessels where marked cellular activity is demonstrable. Many of the vessels ultimately recanalize from complete luminal occlusion. Hyalin deposition in the intima and media of these vessels is slowly but steadily depleted. Figures 5 through 8 represent the comparison between the normally hyalinized, partially, or completely occluded vessels of the aged uterine wall in the control subject (fig. 5) as opposed to the markedly active regenerative processes in the blood vessels of the uterus in the subjects under sex steroid influence (figs. 6-8).

It is immediately apparent from casual inspection of the medial layers of the vessels and the perivascular activity demonstrated in the stimulated sections, that the phase of reactivation and regeneration of tissue is of major moment. The vessel walls and perivascular tissues have responded to the stimulation of the steroid replacement by cellular multiplication. The nuclei in the medial layers of the vessels demonstrated are apparently reactivated. The medial layers are thickened with the bundles becoming much more prominent. The perivascular activity is confined to the connective tissue elements immediately adjacent to the vessel walls. Here nuclear activity and increased substance of the cell bodies are apparent. It should be pointed out at this time that average activity sections were used for demonstration purposes rather than any attempt at special selection.

Serial sections of the uterine wall tissue have shown recanalization from luminal occlusion in many small vessels. It is impossible to demonstrate this in a few photomicrographs.

The Ovary: The senile ovary is a grayish white color, smaller than usual size, and completely without follicular activity. This general picture has been preserved in the ovary of the individual under hormone replacement therapy. There are no significant macroscopic changes in such an ovary other than an obviously increased blood supply demonstrated by marked reactivity of hilar vessels. The ovarian capsule continues without signs of activity. No evidence of follicle regeneration has been noted despite careful inspection of 11 autopsy specimens.

Microscopically the stroma and cortex of the ovaries are basically unchanged. The photomicrographs shown in figures 9 and 10 are taken from the source of the only constant evidence of ovarian reactivity. The control (fig. 9) and therapy (fig. 10) illustrations show representative sections of the vessels of the hilus of the ovary. Again the marked medial layer activity in the small vessels from the therapy patients is of real interest. The cellular changes are similar to those described for the uterine vessels. There is a marked reduction in perivascular activity, however, when compared to the uterine sections. Again no effort at special selection from the numerous autopsy sections was carried out.

The Breast: Macroscopically there is little to demonstrate in relation to breast development under long range sex steroid influence. It is true that many of the patients initially complained of breast tenderness and enlargement when therapy was first instituted. This subsided, however, within three to four months after onset of steroid replacement. The notable exception to this rule were the patients assigned to the Group I experiment (constant estrogen

stimulation with regularly superimposed progesterone exhibition and withdrawal). These patients frequently complained of fullness and distention of the breasts during the terminal stages of the progesterone exhibition, when this influence had been maintained for a week or more. There was little permanent change, however, in breast size, turgidity of the nipples, or venous engorgement.

Examination of the microscopic sections are of real interest. The aged breast tissue follows completely the dictum of hormonal response laid down by Geschickter (2, 4) in describing the response to estrogen and progesterone effect in animals and in the young human female.

The resting phase of the breast is shown in figure 11. This is the control section from a 73 year old female who has had no known hormonal stimulation since her menopause 22 years ago. The terminal tubule and its lobule are still well established. There is a marked thickening of the breast stroma, however, and the ductal system is markedly reduced in distribution. The remaining two sections are of breast tissue taken from patients, one of whom was under constant cyclic estrogen therapy (Group II), and the other under constant estrogen maintenance with cyclic superimposed progesterone influence (Group I).

The estrogen stimulation section (fig. 12) shows moderate ductal hypertrophy and stromal diffusion. There is no secretory effect noted in the terminal tubules most of which are in a collapsed, relatively resting state. A moderate monocytic infiltration of the stroma has also been noted. The progesterone section (fig. 13) was fortunately obtained at the end of ten days of stimulation with a daily dosage of 10 mg. There is marked epithelial proliferation within the lobule. The lobules are surrounded by proliferating connective tissue and several of the glands show secretory activity.

There was no marked blood vessel change in the breast tissue that was constant other than a moderate increase in vessel proliferation in the stimulated sections as opposed to the control.

Discussion

The blood vessel regeneration present in some of the target organs under long maintained sex steroid replacement has been described. The reactivation of the target organs, other than the ovary, has been dealt with at length in preceding publications. It is of interest to speculate, yet impossible to decide, whether the vessel regeneration demonstrated is the result of direct hormone influence, or the result of work hypertrophy occasioned by regeneration of organ function under the maintained steroid influence.

The uterus and cervix increase in size to a degree comparable to the normal of the 20 to 40 year age group. The endometrium can be completely regenerated and cyclic production of mucous by the cervical glands reinstituted. It may well be that as the result of this advanced tissue reactivation, the demand for a

Fig. 1. Vagina, 73 years, control section. Note the thin epithelial layer. 30x.

Fig. 2. Vagina, 75 years, stimulated section. Well developed epithelial layer and thickened stroma. 30x.

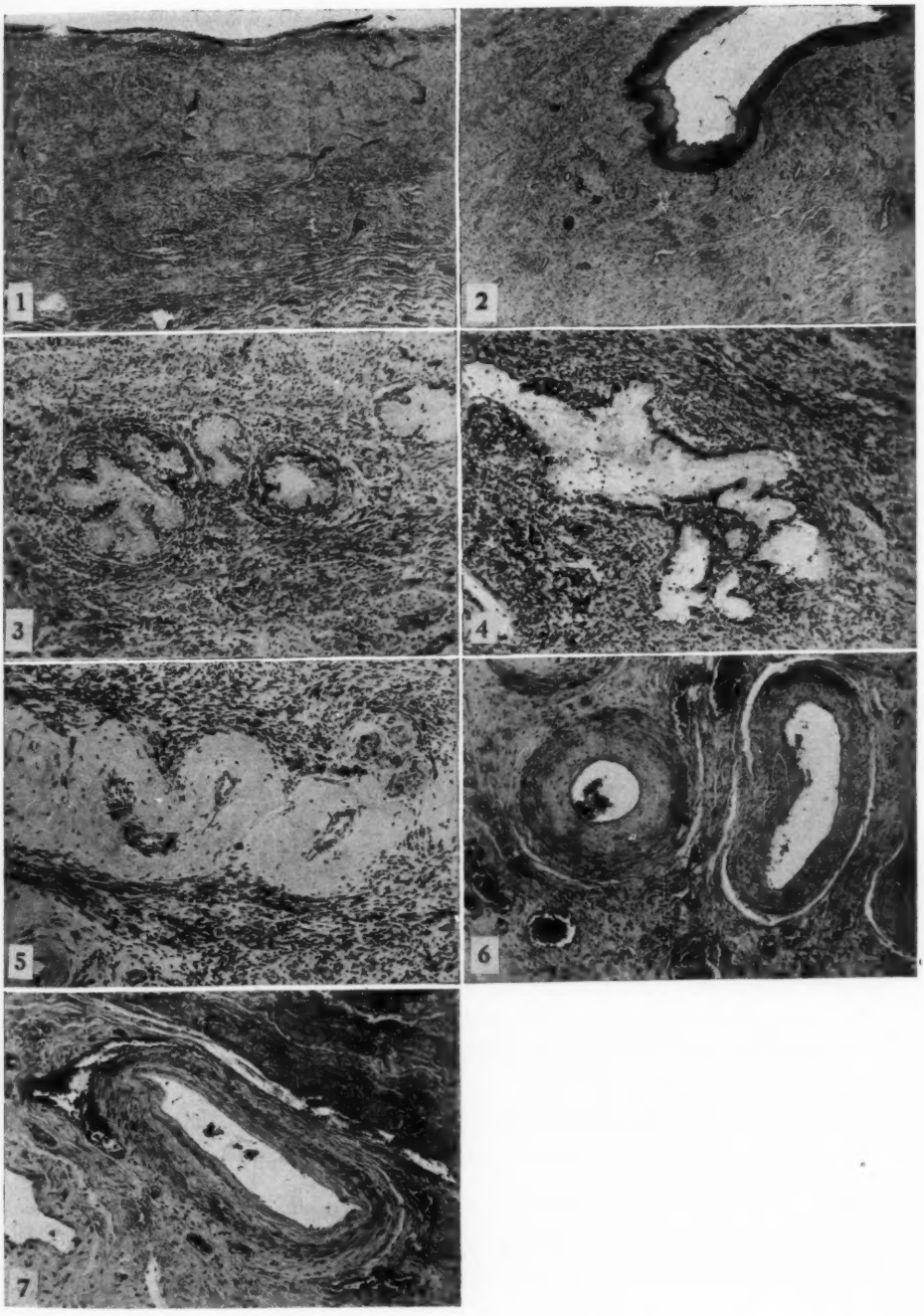
Fig. 3. Cervix, 67 years, control section. Relatively good secretory activity of glands. Note the constructive fibrosis developing in the periglandular spaces. 75x.

Fig. 4. Cervix, 81 years, stimulated section. Hypersecretory glands and marked stromal proliferation. Marked increased in affinity for basophilic stain. 75x.

Fig. 5. Uterine vessels, 73 years, control section. Advanced hyalinization of vessel walls with partial occlusion of lumen. 65x.

Fig. 6. Uterine vessels, 75 years, stimulated section. Moderate medial activity, partial residual hyalinization in media of veins. 95x.

Fig. 7. Uterine vessel, 81 years, stimulated section. Advanced medial activity. 100x.


1
2
3
4
5
6
7

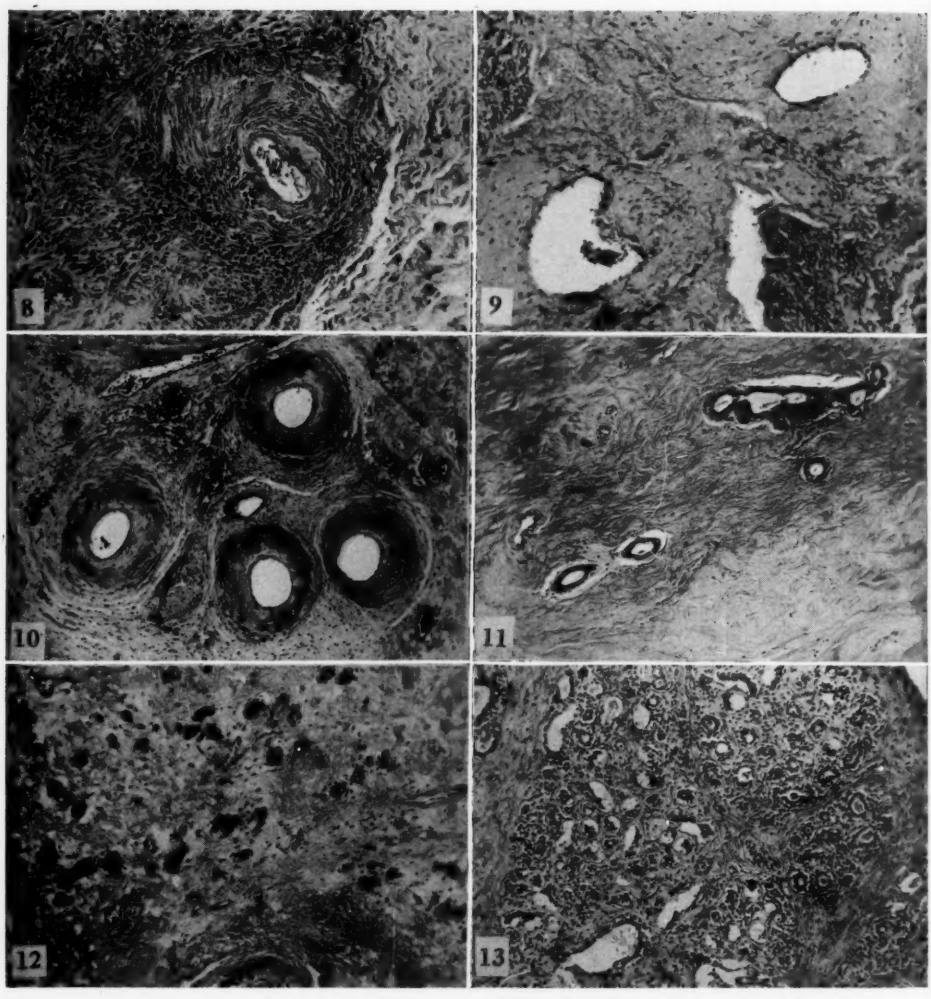


FIG. 8. Uterine vessel, 77 years, stimulated section. Marked perivascular activity. 120x.

FIG. 9. Ovarian vessels, 78 years, control section. Absence of media and unstimulated ovarian stroma. 100x.

FIG. 10. Ovarian vessels, 76 years, stimulated section. Marked medial and perivascular activity. Patchy hyalinization just beneath intima of vessels still demonstrable. 70x.

FIG. 11. Breast tissue, 73 years, control section. Terminal tubule and lobule, thickening of stroma, reduction of ductal distribution. 75x.

FIG. 12. Breast tissue, 76 years, stimulated section (estrogen only). Moderate ductal hypertrophy, collapsed terminal tubules. 85x.

FIG. 13. Breast tissue, 79 years, stimulated section (estrogen and cyclic progesterone). Marked epithelial proliferation within lobules and some secretory activity, stromal proliferation also noted. 85x.

greater and more effective blood supply is the primary cause for the recanilization of thrombosed vessels, hyalin dispersement, and the gross activity in the medial layers of the blood vessels so easily demonstrated microscopically.

As opposed to this point of view, however, is the case in point of the ovary. This particular target organ shows no evidence either macroscopically or microscopically of regenerative changes under long range steroid stimulation. Yet sections of the blood vessels taken from the hilus of the ovary show marked medial activity as demonstrated by figure 10. Certainly there is no work hypertrophy possible here yet we find definite changes suggesting reactivation of vascular tissue.

The fact that although the vagina returns to a completely functional state under maintained sex steroid influence, no significant degree of activity can be demonstrated in sections of the vaginal blood vessels is of considerable import. The breasts also show no evidence of marked activity in the medial layers of the blood vessel walls despite obvious ductal stimulation. The amount of stimulation is in direct proportion to the type and extent of the various sex steroid influences. Thus the vagina and breasts show evidence of return of function without significant blood vessel stimulation. The corpus demonstrates both a return of function and marked regenerative activity of the smaller blood vessels. The ovary provides the final comparison with no evidence of functional reactivity, yet definite blood vessel changes.

It is probable then that both the factors of direct endocrine stimulation and of work hypertrophy are distinctly involved. First, there is apparently direct action on susceptible vascular tissue (medial layers) developed by the long range steroid deplacement technique, and second, it is apparent that the influence of the surrounding tissues, causing a work hypertrophy type of demand as in the case of the uterine muscularis, must also play a part in the general stimulus resulting in hypertrophy and reactivity in the vascular system.

Summary

Under long range sex steroid influence a return of function can be demonstrated macroscopically and microscopically in the vagina, uterus, and breast. The ovary remains completely unstimulated from a functional point of view.

Examination of histologic sections reveal marked regenerative activity in the medial layers of the smaller blood vessels in the corpus and ovary together with vessel recanilization and hyalin dispersement in further uterine sections. There is no significant evidence of blood vessel reactivation in either the vagina or the breast.

The Schering Corporation, and Ayerst, McKenna & Harrison Limited have most graciously supplied the sex steroids necessary to carry to completion this six year project.

References

1. Davis, M. E.: The Treatment of Senile Vaginitis with Ovarian Follicular Hormone. *Surg., Gynec. & Obst., 61:* 680-686, 1935.
2. Geschickter, C.: *Diseases of the Breast.* J. B. Lippincott and Co., Philadelphia, 1943.
3. Hamblen, E. C.: *Endocrinology of Woman.* Charles C. Thomas, Springfield, 1945.
4. Lewis, D., and Geschickter, C.: Ovarian Hormones in Relation to Chronic Cystic Mastitis. *Am. J. Surg., 24:* 280-304, 1934.
5. Masters, W. H., and Allen, W. M.: Female Sex Hormone Replacement in the Aged Female. *J. Gerontol., 3:* 183-189, 1948.
6. Masters, W. H., and Magallon, D. T.: Androgen Administration in the Postmenopausal Female. *J. Clin. Endocrinol., 10:* 348-358, 1950.
7. Masters, W. H., and Magallon, D. T.: Hormone Replacement Therapy in the Aged Female—Estrogen Bioassay. *Proc. Soc. Exper. Biol. & Med., 73:* 672-676, 1950.

Submitted for publication May 21, 1952

The author's address is:

Dr. William H. Masters

Department of Obstetrics and Gynecology

Washington University School of Medicine

St. Louis 10, Missouri

The Normal Precordial Electrocardiogram in the Aged

O. OLBRICH AND E. WOODFORD-WILLIAMS

SINCE the electrocardiograph has been used clinically as a routine procedure, many authors have described electrocardiographic changes in the aged. In the majority of cases, these changes have been ascribed to "coronary disease."

It has been commonly reported that with advancing years the incidence of abnormal electrocardiograms increased. Fox, Clements, and Mandel (3) analysed their "mortality group" and found that 90 per cent of the patients in this group had abnormal electrocardiograms. Willius (13) found no clinical evidence of heart disease in half of the patients examined. The electrocardiographic changes described were found partly significant and partly, although abnormal, less significant in the aged than in the younger age groups (2, 4, 6, 10, 12). Gavey (5) in 360 subjects over the age of 70, found many aged whose electrocardiograms deviated little from the accepted normal for young adults.

Since the introduction of the unipolar precordial and extremity leads based on fundamental work of American investigators, a higher incidence of significant abnormalities has been demonstrated in the aged. Wosika and associates (15), using 12 and more leads, systematically investigated aged persons (over the age of 70) irrespective of their cardiac condition.

The present study is concerned with electrocardiograms in aged subjects and an analysis of deviations from the accepted "norm" of the younger population. Electrocardiograms from 500 in- and out-patients (all over the age of 60) admitted during a period of four months to the Geriatric Unit of the Sunderland Group of Hospitals have been analysed. Among these 500 patients, 154 were found whose tracings complied with the accepted normal pattern.

METHOD

All patients admitted were examined clinically, radiologically (screened and/or 2 M. films taken), and electrocardiograms were taken on the Cossor Direct Writing Machine using 13 leads routinely as follows: 3 standard leads, 3 unipolar limb leads, and 7 precordial leads from V1 to V7 inclusive. Whenever necessary, further leads were also taken. All recordings were made with the subject in the supine position after a one-quarter to one-half hour rest period. Fifty young normal subjects (aged 20 to 40, male and female nurses, young doctors, clerical staff) were investigated under the same basic conditions. The tracings were projected with an epidiascope on a screen obtaining 8 to 10-fold magnification for measurements of amplitudes and time. The findings in the young controls were compared with those of previous workers (7, 8, 11, 14, 15).

RESULTS

Table 1 shows the age and sex distribution, together with the incidence of normal and abnormal electrocardiographic findings in the 500 patients investigated. Of abnormalities of rate and rhythm, only auricular fibrillation is included in the table. Arbitrarily, normal systolic pressure was taken as 110 to 165 mm. Hg. and normal diastolic as 75 to 95 mm. Hg.

Presented at the Second International Gerontological Congress and Fourth Annual Scientific Meeting of the Gerontological Society, Inc., September 9-14, 1951, St. Louis, Missouri. Published on a grant from the Forest Park Foundation.

TABLE 1. DISTRIBUTION OF AGE, SEX AND INCIDENCE OF DISEASES

	N	Total		Age (years)						
		N	%	60-64	65-69	70-74	75-79	80-84	85-89	90 and over
NORMAL AGED										
Males	76			17	15	16	13	7	7	1
Females	78	154	30.8	6	23	15	16	10	5	3
L V H and S										
Males	27			5	2	11	5	3	1	-
Females	33	60	12.0	9	11	9	-	4	-	-
L V S										
Males	22			3	3	6	5	3	2	-
Females	15	37	7.4	1	2	3	7	1	1	-
R V S										
Males	6			1	3	-	-	2	-	-
Females	3	9	1.8	-	1	1	-	1	-	-
ISCHAEMIC										
Males	6			-	-	3	2	-	1	-
Females	7	13	2.6	-	4	-	2	-	1	-
RIGHT B B B										
Males	24			1	9	4	5	2	3	-
Females	9	33	6.6	2	1	2	2	-	2	-
LEFT B B B										
Males	8			3	1	2	1	1	-	-
Females	4	12	2.4	-	-	3	1	-	-	-
COMPLETE BLOCK										
Males	2			-	-	-	1	1	-	-
Females	-	2	0.4	-	-	-	-	-	-	-
AURICULAR FIBRILLATION										
Males	22			4	3	6	4	4	1	-
Females	27	49	9.8	5	4	5	7	4	2	-
CORONARY THROMBOSIS										
Anterior										
Males	36			10	7	6	5	5	3	-
Females	20	56	11.2	3	2	6	4	2	3	-
Posterior										
Males	17			3	4	3	6	1	-	-
Females	9	26	5.2	-	3	1	3	1	1	-
Cases with irregularities of rhythm (ungrouped)		49	9.8							
		500	100							

L V H and S Left Ventricular Hypertrophy and Strain
R V S Right Ventricular Strain
L V S Left Ventricular Strain
B B B Bundle Branch Block

Blood Pressure Distribution. The electrocardiograms were analysed according to the three blood pressure groups shown in table 2. Student's t-test was applied to ascertain whether any significant difference could be found between the various amplitudes in these groups. No significant differences were found, and accordingly the data on these 154 subjects were grouped together.

Position of the Heart. In the young the vertical and semi-vertical positions predominate, whereas in the aged the horizontal and semi-horizontal positions are more common. With advancing years the number of cases with horizontal hearts increases, as shown in table 3.

In all aged subjects with left axis deviation the heart was found in the horizontal, semi-horizontal, or intermediate position (table 4).

P Wave. In the precordial and unipolar extremity leads practically no difference could be found in the shape of the P waves, but there was considerable difference between the means of the amplitudes of the old and young subjects (table 5). This difference is statistically significant. In the precordial leads of the young controls from V_3 to V_7 inclusive, no

TABLE 2. BLOOD PRESSURE DISTRIBUTION AMONG 154 CLINICALLY NORMAL AGED MALES AND FEMALES

Age (years)	Normal		High Systolic		High Diastolic		Total
	Male	Female	Male	Female	Male	Female	
60-69	20	11	1	6	11	10	59
70-79	15	14	7	4	6	15	61
80 and over	7	3	4	8	5	7	34
Total	42	28	12	18	22	32	154

TABLE 3. POSITION OF HEART ACCORDING TO AGE

Percent Distribution

Position	Age (years)		
	60-69	70-79	80 and over
Horizontal	33	35	58
Semi-horizontal	17	16	17
Intermediate	15	19	8
Semi-vertical	26	20	14
Vertical	9	10	3

TABLE 4. AXIS DEVIATION RELATED TO POSITION OF HEART

Position	Axis Deviation					
	None		Left		Right	
	Young	Old	Young	Old	Young	Old
Horizontal	0	4	0	55	-	-
Semi-horizontal	3	3	1	21	-	-
Intermediate	13	13	2	11	-	-
Semi-vertical	21	32	1	-	-	-
Vertical	13	12	-	-	-	2

negative P wave was found, all P waves were positive, and only in one case was the P wave absent in V7. In all 7 precordial leads the P waves were of smaller amplitude and shorter duration in the aged than in the young controls. The difference in the duration of the P waves is small between the two groups. With advancing years more and more cases were found with no P waves in the precordial leads.

Table 6 shows the percentage distribution of the P wave in the different chest leads and the increased number of cases with absent P waves in the aged.

In the unipolar extremity leads the findings were similar especially in AVL where in 29 per cent of the cases the P wave was isoelectric. Negative P waves in leads V1 and V2 are not uncommon. They occur in both the young and in the aged.

Q Wave. In the first 3 precordial leads, no Q waves were found in the young controls, whereas in the aged, 11 per cent of the cases showed Q wave in V3 (table 7). The more the electrode moves to the left, the greater the number of Q waves observed in the aged. The amplitudes of the Q waves were smaller in the aged than in the young controls. In the unipolar extremity leads, only AVL showed a significant difference in the number of cases where a Q wave appeared. The range of amplitude of the Q wave of the aged, 0.25 to 0.5 mm., as compared with the R wave, is always in proportion, i.e., 25 per cent at the maximum. This is significant from the diagnostic point of view, especially in the diagnosis of high lateral myocardial infarction. The percentage distribution of the Q wave with regard to the age groups has shown that V3, representing the transitional zone, displayed an increasing number of cases with Q waves (table 8). In the seventh decade, 5.5 per cent, in the eighth 9.1 per cent, and in the ninth and tenth 19.4 per cent of the cases had a Q wave in the precordial lead V3. In the left precordial leads V4 to V7 inclusive, the Q wave distribution showed no significant variation between ages.

R Wave. The mean amplitudes of the R waves did not differ significantly in the aged from those of the young (table 9). In the different age groups the amplitudes of the R waves showed only a slight increase with advancing years in the precordial leads from V4 to V6 inclusive.

S Wave. In the same leads and in the same age groups where the R wave showed a slight increase, the S wave showed correspondingly a slight decrease (table 10).

R in V5 + S in V1 and R in V1 + S in V5. The sum of R in V5 and S in V1, representing the left ventricular potential, did not show any change with age, although the mean of the sum of R in V5 and S in V1 was slightly

TABLE 5. AMPLITUDES AND DURATIONS OF P WAVES IN PRECORDIAL LEADS NORMAL YOUNG COMPARED WITH NORMAL AGED

Lead	Subjects	Observation		Form*	P AMPLITUDE (In Millimeters)			DURATION (In Seconds)		
		N	%		Mean	S. D.	Range	Mean	S. D.	Range
V1	Young	46	92	P	0.78	0.32	0.25 - 1.5	0.06	0.010	0.04 - 0.10
		2	4	N	−0.38		−0.25 - −0.5			
		1	2	D	0.50					
		1	2	I	0					
	Aged	91	60	P	0.60	0.29	0.25 - 1.5	0.05	0.012	0.04 - 0.08
		50	32	N	−0.68	0.28	−0.25 - 1.0			
		4	3	D	0.625					
		7	5	I	0					
V2	Young	49	98	P	0.73	0.27	0.25 - 1.0	0.07	0.014	0.05 - 0.12
		1	2	N	0.50					
	Aged	117	77	P	0.61	0.29	0.25 - 1.0	0.05		
		10	6	N	0.575	0.03	−0.25 - −1.0	0.05	0.015	0.03 - 0.10
		3	2	D	0.4					
		22	15	I						
V3	Young	50	100	P	0.78	0.29	0.25 - 1.5	0.07	0.01	0.06 - 0.10
	Aged	115	83	P	0.56	0.28	0.25 - 2.0	0.06	0.017	0.03 - 0.12
		1	1	N	−0.25					
		23	16	I	0					
V4	Young	50	100	P	0.76	0.26	0.25 - 1.0	0.07	0.01	0.06 - 0.10
	Aged	139	90	P	0.61	0.32	0.25 - 2.0	0.06	0.019	0.04 - 0.14
		15	10	I	0					
V5	Young	50	100	P	0.76	0.29	0.25 - 1.0	0.07	0.011	0.06 - 0.11
	Aged	139	90	P	0.62	0.31	0.25 - 2.0	0.06	0.016	0.03 - 0.10
		15	10	I	0					
V6	Young	50	100	P	0.78	0.28	0.25 - 1.0	0.08	0.012	0.05 - 0.12
	Aged	131	89	P	0.60	0.31	0.25 - 1.0	0.06	0.016	0.03 - 0.12
		16	11	I	0					
V7	Young	49	98	P	0.73	0.30	0.25 - 1.5	0.08	0.011	0.06 - 0.10
		1	2	I	0					
	Aged	124	88	P	0.59	0.30	0.25 - 1.0	0.06	0.017	0.03 - 0.12
		17	12	I	0					
AVL	Young	43	90	P	0.62	0 25	0.25 - 1.0	0.07	0.014	0.04 - 0.10
		2	4	N	−0.38		−0.25 - −0.5			
		3	6	I	0					
	Aged	78	52	P	0.55	0.26	0.25 - 1.0			
		27	18	N	−0.58	0.29	−0.25 - −1.0	0.06	0.015	0.03 - 0.10
		1	1	D	0.5		0.5			
		43	29	I	0					
AVR	Young	50	100	N	−0.91	0.19	−0.5 - −1.0	0.08	0.013	0.06 - 0.12
	Aged	148	97	N	−0.79	0.29	−0.25 - −2.0	0.07	0.015	0.03 - 0.12
		2	1	P	0.25					
		3	2	I	0					
AVF	Young	50	100	P	0.89	0.25	0.25 - 2.0	0.08	0.010	0.05 - 0.10
	Aged	146	95	P	0.85	0.40	0.25 - 3.0	0.07	0.017	0.04 - 0.10
		3	2	N	−0.92		−0.25			
		4	3	I	0					

*P = Positive
N = Negative
D = Diphasic
I = Isoelectric

TABLE 6. PERCENTAGE DISTRIBUTION OF THE P WAVE ACCORDING TO AGE

Lead	Age (years)											
	60-69				70-79				80 and over			
	Positive	Negative	Diphasic	Isoelectric	Positive	Negative	Diphasic	Isoelectric	Positive	Negative	Diphasic	Isoelectric
V1	67	25	5	3	52	40	2	6	63	29	2	6
V2	84	3	3	10	66	8	-	26	82	6	3	9
V3	84	-	-	16	87	-	-	13	78	4	-	18
V4	95	-	-	5	86	-	-	14	88	-	-	12
V5	95	-	-	5	85	-	-	15	91	-	-	9
V6	93	-	-	7	88	-	-	12	85	-	-	15
V7	93	-	-	7	84	-	-	16	85	-	-	15

greater in the aged (21.0) than in the young controls (18.3) (table 11).

The mean of the sum of R in V1 and S in V5, representing the right ventricular potential, did not differ in the young and old (2.5 and 2.6 respectively). There was, however, a slight decrease with advancing years when the different decades were compared, although this is not statistically significant.

QRS Duration. The duration of the QRS complex was longer in the aged than in the young in all precordial leads and in the unipolar extremity leads. The ventricular activation time (Sokolow, 11) in the precordial leads, i.e., the time measured from the beginning of Q wave to the peak of the R wave (onset of the intrinsic deflection), differed slightly in the aged from that found in the young controls in the left precordial leads (tables 12 and 13).

RS-T Segment. The RS-T segment showed no displacement in the 50 young controls (table 14). In the aged, in the precordial lead V1, 28 per cent showed elevation, and in lead V2, 33 per cent. Depression of the RS-T segment occurred first in lead V3 and increased percentage-wise in leads V4 and reached 11 per cent of all cases in V5. It is a debatable point whether this displacement, which attained in some cases an amplitude of 1 mm., should be considered as a normal phenomenon attributable to age *per se*. The depression of the RS-T segment is an expression of failure of complete diastolic repolarisation and signifies changes in the subendocardial muscle layer, due, in our own cases, to vascular degeneration. The number of cases with RS-T depressions increased in the eighth, ninth, and tenth decade threefold of those in the seventh decade (table 15).

T Wave. The T wave was classified according to shape and duration (table 16). The shape was classified as positive, negative, diphasic, or isoelectric. The shape of the T wave in the aged did not differ significantly from that of the normal young controls. The mean amplitude of the T waves in precordial leads decreased significantly in the aged as compared with the young.

With regard to percentage distribution according to age, no significant differences in amplitude of the T wave could be detected in the different decades (table 17). We assume

TABLE 7. AMPLITUDES OF QR AND S WAVES IN PRECORDIAL LEADS. NORMAL YOUNG COMPARED WITH NORMAL AGED

Lead	Subjects	Q AMPLITUDE (In Millimeters)						R AMPLITUDE (In Millimeters)						S AMPLITUDE (In Millimeters)							
						Wave Absent						Wave Absent						Wave Absent		QS Absent	
		N	Mean	S.D.	Range	N	%	N	Mean	S.D.	Range	N	%	N	Mean	S.D.	Range	N	%	N	
V1	Young	-	-			50	100	49	2.06	1.06	0.25 - 5.5	1	2	49	6.86	2.9	1.0 - 14.0	-	-	1	
	Aged	1	0.25					131	1.4	1.22	0.125 - 9.0	24	16	135	8.4	4.08	2.0 - 25.0	-	-	17	
V2	Young	-	-			50	100	50	4.29	1.86	1.0 - 9.0	-	-	50	10.26	4.28	0.5 - 23.0	-	-	-	
	Aged	1	0.50					149	3.7	3.13	0.25 - 17.0	5	3	148	7.8	0.04	1.0 - 20.0	1	0.7	3	
V3	Young	-	-			50	100	50	7.12	3.52	2.0 - 15.0	-	-	46	5.05	2.81	0.5 - 12.0	4	8	-	
	Aged	14	0.80	0.08	0.25 - 3.0	128	89	137	8.2	5.21	0.5 - 25.0	-	-	129	6.2	3.99	1.0 - 20.0	8	6	-	
V4	Young	12	0.27	0.17	0.125 - 0.5	38	76	50	11.67	4.22	3.0 - 21.0	-	-	36	2.39	1.62	0.5 - 6.0	14	28	-	
	Aged	49	0.66	0.38	0.25 - 3.5	104	68	153	12.8	5.68	2.0 - 30.0	-	-	116	4.2	3.29	0.5 - 17.0	37	25	-	
V5	Young	28	0.42	0.35	0.05 - 1.25	22	44	50	11.61	3.31	3.0 - 19.0	-	-	22	1.14	0.77	0.5 - 3.0	28	56	-	
	Aged	68	0.54	0.31	0.25 - 3.5	86	56	154	12.6	4.14	4.0 - 25.0	-	-	65	2.5	1.95	0.25 - 10.0	89	58	-	
V6	Young	37	0.61	0.37	0.125 - 2.0	13	26	50	10.21	2 68	5.0 - 16.0	-	-	9	0.78	0.25	0.5 - 1.0	41	82	-	
	Aged	75	0.48	0.48	0.25 - 3.0	70	48	144	9.8	3 63	3.0 - 22.0	-	-	26	1.7	1.10	0.5 - 4.0	118	82	-	
V7	Young	39	0.60	0.37	0.125 - 2.0	11	22	50	8.78	2.50	4.5 - 15.0	-	-	3	0.75	-	0.25 - 1.0	47	94	-	
	Aged	69	0.38	0.23	0.25 - 1.0	79	53	141	7.4	3.18	2.0 - 16.0	-	-	14	1.3	0.06	0.5 - 3.0	128	90	-	
AVL	Young	9	0.39	-	0.125 - 1.0	37	80	44	3.64	2.41	1.0 - 14.0	4	8	22	1.76	1.22	0.25 - 6.0	24	52	2	
	Aged	75	0.72	0.58	0.25 - 4.0	77	51	139	4.9	2.78	0.5 - 13.0	11	7	19	2.2	2.23	1.0 - 10.0	121	86	10	
AVR	Young	6	5.17	-	3.0 - 7.0	30	83	15	1.43	0.68	0.5 - 3.0	35	70	26	6.31	1.59	4.0 - 11.0	7	21	16	
	Aged	26	4.4	1.67	2.0 - 10.0	127	83	73	0.84	1.95	0.125 - 4.0	80	52	45	6.5	1.90	3.0 - 15.0	28	22	80	
AVF	Young	30	0.47	0.34	0.125 - 1.0	20	40	50	7.0	2.77	2.0 - 14.0	-	-	11	1.07	0.05	0.25 - 2.0	39	78	-	
	Aged	46	0.47	0.30	0.125 - 1.0	107	70	148	4.0	2.59	0.25 - 15.0	5	3	73	2.8	1.94	0.5 - 10.0	76	51	4	

TABLE 8. PERCENTAGE DISTRIBUTION OF THE Q WAVE ACCORDING TO AGE

Lead	Age (years)		
	60-69	70-79	80 and over
V1	-	-	-
V2	-	-	5.9
V3	5.5	9.1	19.4
V4	31.0	32.2	32.4
V5	47.5	40.7	44.1
V6	58.2	44.8	40.6
V7	54.2	39.6	48.4

that such a change may have taken place in earlier decades. With regard to duration, no significant difference was detected between the aged and the young.

Q/R, R/S, and R/T Ratios. The Q/R ratio was increased in the aged as compared with the young in leads V4 and V5 in AVL, AVR, and AVF (table 18). The Q wave was always in proportion to the R wave, i.e., under 25 per cent.

The R/S ratio is important because of the difference in this ratio in the left and right precordial leads.

The calculation of the R/T ratio serves as a useful basis for comparison with electrocardiograms recorded in patients with right ventricular hypertrophy.

The Transitional Zone. The transitional zone represents the effect of the electrical potentials of both ventricles and is obtained when the precordial lead is placed over, or in the vicinity of, the interventricular septum. It varies widely in location. In the young normal controls the transitional zone was located in V3. In the aged, in the majority of cases the same location was found. When the transitional zone was abrupt, the sudden change

TABLE 9. AMPLITUDES (IN MILLIMETERS) OF THE R WAVES ACCORDING TO AGE

Age (years)	Leads									
	V1	V2	V3	V4	V5	V6	V7	AVL	AVR	AVF
60-69	1.33	3.48	8.4	12.7	11.9	8.9	7.2	4.4	0.34	4.4
70-79	1.25	3.5	7.6	12.2	12.9	9.9	7.5	4.5	0.36	3.6
80 and over	1.21	4.12	8.8	14.5	13.7	10.7	7.6	4.7	0.51	3.3

TABLE 10. AMPLITUDES (IN MILLIMETERS) OF THE S WAVE ACCORDING TO AGE

Age (years)	Leads						
	V1	V2	V3	V4	V5	V6	V7
60-69	8.38	8.5	5.8	3.16	1.06	0.22	0.13
70-79	8.32	9.2	6.25	3.6	1.16	0.30	0.08
80 and over	8.29	8.16	5.1	1.3	0.92	0.46	0.15

TABLE 11. LEFT AND RIGHT VENTRICULAR POTENTIALS (IN MILLIMETERS) RELATED TO AGE

Age (years)	Leads	
	R in V5 + S in V1	R in V1 + S in V5
60-69	20.9	2.76
70-79	20.9	2.36
80 and over	20.9	2.11

occurred mostly between V2 and V3, except in the ninth and tenth decade where this abrupt change took place between V3 and V4.

When compared with electrical axes, it was found that the transitional zone in horizontal and semihorizontal hearts was located in V3, and similarly in intermediate and in semi-vertical positions. In vertical hearts, however, the majority of the transitional zones were located in V4. In clockwise rotation the transitional zone is shifted to the left, and in counter clockwise rotation the transitional zone moves to the right.

P-R Interval. The P-R interval did not change with advancing years (table 19); 154 cases with a normal electrocardiogram showed the same average P-R interval as that found in the young, with the exception of four cases where the intervals (0.24) were above the upper limit of the normal (0.21).

QT Ratio. The QT and the RR intervals were measured. The QT ratio was determined from Goldberger's nomogram (7). The average QT ratio increased with advancing years (table 19). The scatter of this ratio was greater in the aged than in young normals. In the seventh decade the QT ratio was 1.01, slightly lower than the mean QT ratio in the normal young controls (1.03). In the eighth decade this ratio increased to 1.05, and in the ninth and tenth decade to 1.07. The average normal QT ratio is given by Goldberger as 1.02 for women and as 1.01 for men. The maximum normal value in women is given as 1.09 and in men as 1.08.

Discussion

The difficulty of establishing "normal" values of the electrocardiogram is greater in the aged than in the younger population. Chronologic and biologic aging do not run parallel; the rate of aging differs in single organs, and this aging process also varies from individual to individual. When establishing norms, we always encountered the difficulty of the greater scatter in the aged as compared with the young, and—in spite of the great care taken—we probably included among our normal aged group cases that could not properly be termed "normal."

The gradually decreasing size of the capillary bed leads slowly to a diminished blood supply to the heart muscle, thereby interfering with the heart's metabolism, especially its oxygen supply, and with the process of electrical phenomena of polarisation, depolarisation, and repolarisation. This was our fundamental conception when we compared the different amplitudes of the electrocardiogram in the aged with those of the young controls. When, at autopsy, the heart and its supplying vessels were examined, it was frequently found that no perfect correlation could be established between the electrocardiographic and the postmortem findings, apart from gross lesions. Among the 200 autopsies, about 25 per cent were normal hearts; although if the method of Schlesinger and Blumgart (1) had been applied and an intensive histologic examination undertaken, this large number of normals

TABLE 12. Q R S DURATIONS (IN SECONDS) IN NORMAL YOUNG AND NORMAL AGED SUBJECTS

Lead	Subjects	N	Mean	S. D.	Range
V1	Young	49	0. 03	0. 008	0. 02 - 0. 06
	Aged	152	0. 07	0. 012	0. 04 - 0. 10
V2	Young	50	0. 03	0. 001	0. 02 - 0. 06
	Aged	152	0. 08	0. 011	0. 04 - 0. 11
V3	Young	50	0. 04	0. 007	0. 02 - 0. 06
	Aged	139	0. 08	0. 011	0. 04 - 0. 10
V4	Young	50	0. 04	0. 008	0. 03 - 0. 07
	Aged	153	0. 07	0. 014	0. 04 - 0. 10
V5	Young	50	0. 04	0. 008	0. 003 - 0. 06
	Aged	153	0. 06	0. 018	0. 04 - 0. 10
V6	Young	50	0. 05	0. 009	0. 003 - 0. 06
	Aged	144	0. 06	0. 019	0. 04 - 0. 10
V7	Young	50	0. 05	0. 009	0. 04 - 0. 07
	Aged	141	0. 06	0. 014	0. 03 - 0. 08
AVL	Young	49	0. 04	0. 013	0. 02 - 0. 08
	Aged	150	0. 06	0. 016	0. 04 - 0. 12
AVR	Young	49	0. 04	0. 011	0. 03 - 0. 08
	Aged	153	0. 05	0. 014	0. 04 - 0. 08
AVF	Young	50	0. 05	0. 011	0. 03 - 0. 08
	Aged	153	0. 06	0. 016	0. 04 - 0. 09

TABLE 13. VENTRICULAR ACTIVATION TIME (IN SECONDS) IN NORMAL YOUNG AND NORMAL AGED SUBJECTS

Lead	Subjects	N	Mean	S. D.	Range
V1	Young	49	0.015	0.004	0.015 - 0.02
	Aged	70	0.019	0.009	0.010 - 0.04
V2	Young	50	0.02	0.008	0.015 - 0.04
	Aged	125	0.019	0.009	0.010 - 0.04
V3	Young	50	0.029	0.008	0.015 - 0.04
	Aged	133	0.026	0.010	0.025 - 0.04
V4	Young	50	0.03	0.009	0.015 - 0.04
	Aged	153	0.033	0.009	0.010 - 0.05
V5	Young	50	0.03	0.010	0.020 - 0.06
	Aged	154	0.036	0.008	0.015 - 0.05
V6	Young	50	0.03	0.010	0.015 - 0.06
	Aged	143	0.037	0.008	0.015 - 0.06
V7	Young	50	0.03	0.011	0.020 - 0.06
	Aged	141	0.038	0.007	0.020 - 0.06

would no doubt have been considerably decreased.

Depression of the S-T junction and segment, and alterations in the shape and amplitude of the T waves, are ascribed in the aged to vascular changes affecting the subendocardial layer of the myocardium of the left ventricle. The changes in intrinsic deflection are assumed to have taken place by alteration in the action current of the aged, whereas the registered Q waves in the precordial lead V_3 may be explained by the position the heart takes up in the thoracic cavity.

The heart, fixed in the thoracic cavity by the great vessels at its base and supported in this position by the lungs and diaphragm, might rotate and become displaced with the apex forwards or backwards. The short wide chest and the high diaphragm, for example, change the position of the heart to such a degree that it shifts upwards and rotates to the left. In the long and narrow chest, on the other hand, the heart takes up a more vertical position (9).

Summary

1. The horizontal position of heart was common in the aged.
2. P waves were smaller in amplitude in the aged than in the young controls, and with

TABLE 14. RST SEGMENT IN NORMAL AGED

(The RST Segment was Isoelectric in all 50 Normal Young Subjects)

Lead	Observation		Form*	Displacement from Isoelectric Line in Millimeters		
	N	%		Mean	S.D.	Range
V1	43	28	P	0.94	0.17	0.5 - 1.5
	109	72	I			
V2	51	33	P	1.04	0.33	0.5 - 2.0
	1	1	N	-0.50		
	101	66	I			
V3	26	18	P	0.96	0.37	0.5 - 2.0
	5	3	N	-0.80		-0.5 - -1.0
	113	79	I			
V4	14	9	P	1.04	0.67	0.5 - 3.0
	17	11	N	0.73	0.25	-0.5 - -1.0
	123	80	I			
V5	5	3	P	0.80		0.5 - 1.0
	17	11	N	-0.79	0.41	-0.25 - -2.0
	152	86	I			
V6	5	3	P	0.60		0.5 - 1.0
	9	6	N	-0.78		-0.5 - -1.0
	136	91	I			
V7	4	3	P	0.50		0.5 - 0.5
	7	5	N	-0.71		-0.5 - -1.0
	140	92	I			
AVL	5	3	N	-0.80		-0.5 - -1.5
	145	97	I			
AVR	6	4	P	0.67		0.5 - 1.0
	1	1	N	-0.50		
	144	95	I			
AVF	7	5	P	0.71		0.5 - 1.0
	9	6	N	-0.67		-0.5 - -1.0
	136	89	I			

*P — Positive
N — Negative
I — Isoelectric

TABLE 15. PERCENTAGE DISTRIBUTION OF RS-T JUNCTION AND SEGMENT ACCORDING TO AGE

Lead	Age (years)					
	60-69		70-79		80 and over	
	Elevated	Depressed	Elevated	Depressed	Elevated	Depressed
V1	30.0	-	30.5	-	18.1	-
V2	31.7	-	32.2	-	32.4	2.9
V3	16.3	5.5	22.2	-	15.6	6.2
V4	8.3	11.6	11.7	8.4	8.8	14.7
V5	3.3	5.0	3.4	15.1	2.9	16.1
V6	6.8	1.7	1.7	8.6	-	9.3
V7	3.3	1.7	1.8	7.1	3.0	6.0

advancing years the percentage of absent P waves increased.

3. With advancing years more Q waves were found in the precordial lead V3. The amplitudes of the R and S waves did not differ.
4. The amplitudes of the R and S waves did not differ significantly in the aged as compared with the young controls.
5. The sum of R in V3 and S in V1, representing the left ventricular potential, and the sum of R in V1 and S in V5, representing the right ventricular potential, did not change with advancing years.
6. The QRS duration was longer in the aged than in the young. The ventricular activation time differed slightly in the aged when compared with the young controls.
7. RS-T depressions in the left precordial leads, especially in V4 and V5, were found in 11 per cent of the aged cases.
8. The amplitudes of the T waves decreased with advancing years.
9. The transitional zone depends on the rotation of the heart around its three axes.
10. The PR interval did not change with advancing years.
11. The QT ratio increased with age but not above the upper limit of the "normal."

We would like to thank Mr. D. A. Sanford, M.R.C.P., F.R.C.S., for his critical review of the text, Mrs. D. B. Olbrich for her assistance in the statistical work, and Mrs. L. W. Cameron for her secretarial work.

References

1. Blumgart, H. L., Schlesinger, M. J., and Davis, D.: Studies on the Relation of the Clinical Manifestations of Angina Pectoris, Coronary Thrombosis, and Myocardial Infarction to the Pathologic Findings. *Am. Heart J., 19:* 1-91, 1940.
2. Davis, J. O.: The Electrocardiographic Changes in the Aging Heart. *J. Gerontol., 2:* 265-267, 1947.
3. Fox, T., Klements, J., and Mandel, E. E.: Electrocardiographic Changes in Old Age. *Ann. Int. Med., 17:* 236-246, 1942.
4. Fox, T. T., Weaver, J. C., and Francis, R. L.: Further Studies on Electrocardiographic Changes in Old Age. *Geriatrics, 3:* 35-41, 1948.
5. Gavey, C. J.: The Cardiology of Old Age. *Lancet, 2:* 725-736, 1949.
6. Gelman, I., and Brown, S.: Electrocardiographic Characterization of Heart in Old Age and in Childhood. *Acta med. Scandinav., 19:* 378-396, 1937.
7. Goldberger, E.: *Unipolar Lead Electrocardiography Including Standard Leads, Unipolar Extremity Leads and Multiple Unipolar Precordial Leads.* Lea and Febiger, Philadelphia, 2nd Edition, p. 364.
8. Hecht, H. H., and Woodbury, L. A.: Electrical

TABLE 16 AMPLITUDES AND DURATIONS OF T WAVES IN PRECORDIAL LEADS NORMAL YOUNG COMPARED WITH NORMAL AGED

Lead	Subjects	Observation		Form*	T AMPLITUDES (In Millimeters)			DURATION OF T WAVE (In Seconds)		
		N	%		Mean	S. D.	Range	Mean	S. D.	Range
V1	Young	21	42	P	0.98	0.55	0.25 - 2.0	0.11	0.024	0.06 - 0.18
		28	56	N	-1.19	0.63	-0.25 - -3.0			
		1	2	I	0					
	Aged	86	57	P	1.8	1.20	0.25 - 4.0			
		50	33	N	-0.9	0.42	-0.25 - -2.0	0.131	0.023	0.08 - 0.20
		2	1	D	1.0					
		14	9	I	0					
V2	Young	49	98	P	3.81	1.9	1.0 - 11.0	0.17	0.031	0.08 - 0.24
		1	2	N	-0.10					
	Aged	144	95	P	3.2	1.91	0.25 - 10.0	0.152	0.029	0.06 - 0.20
		6	4	N	-0.7		-0.25 - -1.0			
		2	1	I	0					
V3	Young	49	98	P	4.37	1.68	1.0 - 8.0	0.17	0.028	0.08 - 0.24
		1	2	I	0					
	Aged	135	96	P	3.7	1.86	0.5 - 8.0	0.159	0.026	0.1 - 0.24
		1	1	N	-1.0					
		5	3	I	0					
V4	Young	50	100	P	4.04	1.6	0.25 - 8.0	0.16	0.028	0.02 - 0.20
	Aged	152	99	P	3.4	1.87	0.25 - 9.0	0.157	0.026	0.08 - 0.24
		1	1	N	-0.25					
V5	Young	50	100	P	3.35	1.4	1.0 - 7.0	0.16	0.017	0.12 - 0.20
	Aged	152	99	P	2.6	1.55	0.25 - 8.0	0.147	0.023	0.08 - 0.20
		2	1	N	-0.75					
V6	Young	50	100	P	2.53	0.87	1.0 - 4.0	0.15	0.020	0.12 - 0.20
	Aged	139	97	P	2.0	1.25	0.25 - 7.0	0.137	0.024	0.08 - 0.20
		3	2	D	0.4					
		2	1	I	0					
V7	Young	50	100	P	2.08	0.70	0.5 - 3.0	0.14	0.020	0.10 - 0.18
	Aged	129	91	P	1.6	0.93	0.25 - 6.0	0.131	0.020	0.08 - 0.18
		1	1	N	-0.25					
		2	1	D	0.4					
		10	7	I	0					
AVL	Young	44	92	P	1.71	0.73	0.25 - 4.0	0.13	0.017	0.08 - 0.16
		3	6	N	-0.50					
		1	2	I	0					
	Aged	82	55	P	1.0	0.62	0.25 - 4.0	0.123	0.023	0.08 - 0.18
		31	21	N	-0.7	0.44				
		36	24	I						
AVR	Young	49	98	N	-2.31	0.72	-1.0 - -4.0	0.13	0.016	0.08 - 0.16
		1	2	P	3.0					
	Aged	149	97	N	-0.9	0.97	-0.5 - -4.0	0.137	0.020	0.08 - 0.18
		4	3	I	0					
AVF	Young	48	96	P	1.7	0.73	0.5 - 3.0	0.12	0.016	0.08 - 0.16
		2	4	I	0					
	Aged	141	92	P	1.4	0.75	0.5 - 3.5	0.129	0.022	0.08 - 0.20
		5	3	N	-0.55					
		1	1	D	0.5					
		6	4	I	0					

*P = Positive
N = Negative
D = Diphasic
I = Isoelectric

TABLE 17 ON PAGE 55 →

TABLE 18. RATIOS QR, RS AND RT IN NORMAL YOUNG COMPARED WITH NORMAL AGED

Lead	Subjects	QR RATIO			RS RATIO			RT RATIO		
		N	Mean	Range	N	Mean	Range	N	Mean	Range
V1	Young	-			49	0.35	0.02 - 1.5	48	2.52	0.03 - 12.0
	Aged	1	0.13		131	0.24	0.06 - 1.5	121	1.5	0.03 - 6.0
V2	Young	-			50	0.48	0.09 - 1.75	50	1.4	0.33 - 4.0
	Aged	2	0.05	0.03 - 0.05	148	0.77	0.04 - 10.0	147	2.0	0.025 - 8.0
V3	Young	-			46	2.46	0.33 - 15.0	49	2.05	0.5 - 13.0
	Aged	13	0.08	0.01 - 0.21	127	2.54	0.09 - 14.0	139	3.2	0.16 - 20.0
V4	Young	12	0.019	0.009 - 0.035	36	7.97	0.33 - 29.0	50	3.85	0.75 - 32.0
	Aged	49	0.04	0.01 - 0.2	114	5.68	0.5 - 25.0	153	6.0	0.33 - 120.0
V5	Young	28	0.032	0.01 - 0.13	22	13.42	1.0 - 36.0	50	4.0	1.0 - 10.0
	Aged	68	0.05	0.01 - 0.35	65	8.64	1.25 - 68.0	154	6.9	1.13 - 56.0
V6	Young	9	0.055	0.01 - 0.2	9	13.06	9.0 - 26.0	50	4.6	1.7 - 12.0
	Aged	75	0.05	0.01 - 0.33	27	7.77	1.0 - 26.0	139	6.8	1.0 - 44.0
V7	Young	39	0.056	0.01 - 0.14	3	15.0	7.0 - 28.0	50	4.8	2.0 - 15.0
	Aged	71	0.05	0.01 - 0.22	14	6.64	1.25 - 12.0	134	6.2	0.67 - 32.0
AVL	Young	9	0.04	0.01 - 0.07	21	2.71	0.33 - 12.0	41	2.2	0.5 - 6.0
	Aged	75	0.15	0.03 - 0.33	18	1.78	0.1 - 8.0	106	6.8	0.5 - 22.0
AVR	Young	6	2.92	1.5 - 6.0	7	0.45	0.03 - 1.25	15	0.55	0.08 - 1.0
	Aged	25	4.33	0.17 - 12.0	46	0.2	0.01 - 1.5	67	5.3	0.06 - 1.5
AVF	Young	30	0.07	0.01 - 0.14	11	6.27	2.5 - 14.0	48	4.9	1.0 - 22.0
	Aged	45	0.15	0.03 - 0.25	72	1.91	0.06 - 11.0	143	3.7	0.16 - 20.0

TABLE 17. AMPLITUDE OF THE T WAVE (IN MILLIMETERS) ACCORDING TO AGE

Age (years)	Leads						
	V1	V2	V3	V4	V5	V6	V7
60-69	1.3	3.2	3.7	3.7	2.62	1.8	1.5
70-79	1.7	2.7	3.4	3.6	2.4	1.9	1.48
80 and over	1.48	3.5	3.65	3.2	2.81	2.1	1.4

← (TABLE 18 ON PAGE 54)

TABLE 19. PR, RR AND QT INTERVALS (IN SECONDS) IN NORMAL YOUNG COMPARED WITH NORMAL AGED

Interval		N	Mean	S.D.	Range
PR	Young	50	0.16	0.02	0.12 - 0.20
	Aged	154	0.16	0.03	0.08 - 0.24
RR	Young	50	0.73	0.12	0.48 - 1.0
	Aged	154	0.77	0.15	0.44 - 1.08
QT	Young	50	0.36	0.03	0.28 - 0.44
	Aged	154	0.38	0.05	0.16 - 0.48

Properties of Tissue. *In: The E.C.G. Principles of Internal Medicine,* H. K. Lewis and Co., London, 1950.

9. Master, A. M.: *The Electrocardiogram and X-Ray Configuration of the Heart.* Lea and Febiger, Philadelphia, 2nd Edition, p. 390.
10. Mazer, M., and Reisinger, J. A.: An Electrocardiographic Study of Cardiac Aging Based on Records at Rest and After Exercise. *Ann. Int. Med., 21:* 645-652, 1944.
11. Sokolow, M., and Friedlander, R. D.: The Normal Unipolar Precordial and Limb Lead Electrocardiogram. *Am. Heart J., 38:* 665-687, 1949.
12. Taran, L. M., and Kaye, M.: Electrocardiographic Studies in Old Age. *Ann. Int. Med., 20:* 954-960, 1944.
13. Willius, F. A.: The Heart in Old Age. A Study of 700 Patients Seventy-Five Years of Age and Older. *Am. J. Med. Sci., 182:* 1-12, 1931.
14. Wilson, F. N., Johnston, F. D., Rosenbaum, F. F., Erlanger, H., Kassman, C. E., Hecht, H., Cotrim, N., Menezes de Oliveira, R., Scarsi, R., and Barker, P. S.: The Precordial Electrocardiogram. *Am. Heart J., 27:* 19-85, 1944.
15. Wosika, P. H., Feldman, E. Chesrow, E. J., and Myers, G. B.: Unipolar Precordial and Limb Lead Electrocardiograms in The Aged. *Geriatrics, 5:* 131-141, 1950.

Submitted for publication February 20, 1952

The senior author's address is:

DR. O. OLBRICH

DIRECTOR, GERIATRIC UNIT

GENERAL HOSPITAL

SUNDERLAND, ENGLAND

The Effect of Change of Body Position on the Precordial Electrocardiogram in Young and Aged Subjects

O. OLBRICH AND E. WOODFORD-WILLIAMS

THE significance of the position of the heart in relation to the thoracic wall has been emphasised by many investigators (3, 9, 10), and Ashman and associates (1) presented the effect on the standard lead electrocardiograms of rotation of the heart around its three axes. Nathanson (6) found in 91 per cent of his patients some deviation of amplitude on change of body position and showed that with moderate rotation the resulting alteration of the QRS complex is sufficient to lead to erroneous interpretation of ventricular preponderance. Changes in amplitude consequent upon change of body position have also been described by Master (5), Graybiel and White (4), White (8), and Siegler (7). All these investigators, without taking into account the age of the subject, studied the effect of postural changes on the three standard electrocardiographic leads.

The amplitudes of the different deflections vary greatly in the aged, and this variation seems to be related to the greater degree of freedom of movement of the heart in the thoracic cavity. In order, therefore, to determine whether this greater degree of freedom of movement of the heart is present in the aged as compared with the young, we studied the effect of change of body position on the unipolar chest leads.

Twenty young subjects (all under the age of 30) and 20 old subjects (all over the age of 70) were electrocardiographed in the horizontal (i.e., lying flat on the back) and in the reclining (i.e., trunk raised from horizontal by 30°-45°) positions. In these two positions the patients were rotated 90° and 180° to the left, and tracings were taken accordingly.

It was found that, when changing from the horizontal to the reclining position, changes in the R wave were noted in all the aged, whereas in 40 per cent of the young group there was no change. The S wave did not change in either group. The T wave changed in 50 per cent and the P wave in 40 per cent of the old group, whereas in the young group the change was only in 15 per cent and 5 per cent respectively (table 1).

When rotating 90° or 180° to the left, in horizontal or reclining positions, the number of cases showing changes differed little between the two groups. The discrepancies were more marked, however, when the magnitudes of the average differences in amplitudes were compared (table 2).

Table 2 presents the average differences in amplitude in V4 when the body was rotated in the position described above. The most striking differences were found in the R wave; this wave increased or decreased when the body position was changed from the horizontal to the reclining position by an average of 3.5 mm. in the old compared with an average of 1 mm. in the young. On rotating the body 90° to the left in the horizontal position, the average difference in amplitude in the R wave was 6 mm. in the old compared with 1.4 mm. in the young. Further rotation by 90° to the left gave an average difference of 7.5 mm. in the old compared with 1.7 mm. in the young. Similar striking changes were observed when

Presented at the Second International Gerontological Congress and Fourth Annual Scientific Meeting of the Gerontological Society, Inc., September 9-14, 1951, St. Louis, Missouri. Published on a grant from the Forest Park Foundation.

TABLE 1. DISTRIBUTION OF CASES ACCORDING TO CHANGE OF BODY POSITION (LEAD V4)

Position Change	Wave	Increase		Decrease		No Change			
		Old	Young	Old	Young	Old		Young	
						N	%	N	%
Hor. to Rec.	R	9	9	11	3	0	-	8	40
	S	3	3	7	6	10	50	11	55
	T	6	2	4	1	10	50	17	85
	P	3	0	5	1	12	60	19	95
Hor. to Hor. 90°	R	11	5	9	12	0	-	3	15
	S	7	13	4	3	9	45	4	20
	T	10	6	4	7	6	30	7	35
	P	8	5	3	5	9	45	10	50
Hor. to Hor. 180°	R	10	7	10	9	0	-	4	20
	S	8	11	5	3	7	35	6	30
	T	15	8	3	5	2	10	7	35
	P	8	6	8	4	4	20	10	50
Rec. to Rec. 90°	R	11	1	9	14	0	-	5	25
	S	10	11	3	3	7	35	6	30
	T	12	4	4	6	4	20	10	50
	P	7	5	1	5	12	60	10	50
Rec. to Rec. 180°	R	10	5	10	13	0	-	2	10
	S	9	15	4	3	7	35	2	10
	T	12	9	4	5	4	20	6	30
	P	10	6	0	5	10	50	9	45

Hor. = Horizontal
Rec. = Reclining

the body was rotated 90° and 180° to the left in the reclining position. Average differences of 4.0 and 3.7 mm. were obtained in the aged compared with 1.6 mm. and 1.4 mm. in the young.

Marked differences were also found in the other deflections in the old group, where not only the average amplitudes varied but there was also a considerable variation in the ranges of all deflections (with the exception of the P wave) in the aged.

A quantitative analysis of changes of amplitude produced by alteration of body position is presented in table 3. This table demonstrates clearly that a comparatively small rotation of the body produced considerable change in the various amplitudes. These potential variations cannot be explained merely by rota-

TABLE 2. AVERAGE DIFFERENCES OF AMPLITUDES (IN MILLIMETERS) ON CHANGE OF BODY POSITION (LEAD V4)

Wave	Age (years)	Horizontal to Reclining		Horizontal to Horizontal 90°		Horizontal to Horizontal 180°		Reclining to Reclining 90°		Reclining to Reclining 180°	
		Millimeters	Range	Millimeters	Range	Millimeters	Range	Millimeters	Range	Millimeters	Range
R	Old	3.5	1 - 12.5	6.02	1 - 17	7.45	1 - 18	4	1 - 12	3.7	1 - 11
	Young	1.0	1 - 3	1.4	1 - 3	1.7	1 - 3	1.6	1 - 8	1.4	1 - 4
S	Old	1.3	1 - 9	1.8	0.5 - 7	2.4	1 - 10	1.5	0.5 - 12	1.45	0.5 - 8
	Young	0.56	0.25 - 2	1.0	0.5 - 2	1.4	0.5 - 5	1.4	0.5 - 3	1.4	0.25 - 4
T	Old	0.825	0.5 - 6.5	1.05	0.5 - 5	1.55	0.5 - 5	1.12	0.5 - 4	1.3	0.5 - 5
	Young	0.17	1 - 1.5	0.5	0.5 - 1	0.78	0.5 - 2.5	0.37	0.5 - 1	0.7	0.5 - 3
P	Old	0.206	0.125 - 1.25	0.212	0.125 - 0.5	0.181	0.125 - 0.5	0.143	0.125 - 0.5	0.225	0.125 - 1.0
	Young	0.012	0.125 - 1.0	0.19	0.125 - 0.5	0.16	0.125 - 0.5	0.15	0.125 - 0.5	0.15	0.125 - 0.5

TABLE 3. VARIATION IN AMPLITUDES (IN MILLIMETERS) DUE TO ROTATION OF THE BODY IN THE AGED (LEADS V5 + V6)

Lead	Supine	Horizontal to Rotation 45°		Horizontal to Rotation 90°		Prone	
		Average Amplitude	Change %	Average Amplitude	Change %	Average Amplitude	Change %
R							
V1	1.56	1.3	− 16	1.5	− 4	2.8	+ 15
V2	2.65	5.5	+ 79	2.3	− 13.3	3	+ 13
V3	9.35	10.2	+ 9	8.5	− 9	8.8	− 6
V4	15.1	14.5	− 4	9.5	− 37.2	12.4	− 18
V5	12.1	14.1	+ 16	18	+ 49	18.5	+ 48
V6	7.7	12.8	+ 64	26.5	+244	14.3	+ 85
AVL	7.2	6.6	− 8	6.5	− 10	3.3	− 55
AVR	0	0	0	0	0	0	0
AVF	4.4	5.3	+ 16	6.5	+ 50	4.5	+ 2
S							
V1	13	11	− 15	11.7	− 10	10.5	− 19
V2	13	7.3	− 44	9.3	− 28	11	− 15
V3	7.5	6.7	− 19	10	− 13.3	5.5	− 28
V4	6.7	5.6	− 16	7.5	+ 12	6.7	0
V5	2.2	2.1	− 5	4.8	+118	3.3	+ 50
V6	2.0	1.8	− 10	5	+150	3.3	+ 65
AVL	0	0	0	0	0	0	0
AVR	6	6	0	5.5	− 8	8	+ 33
AVF	4.2	3.3	− 22	5.5	− 30	0.7	− 83
T							
V1	3.5	2	− 43	2.5	− 29	0.5	− 86
V2	7.4	8	+ 8	4.8	− 35	1.5	− 80
V3	5.3	5.8	+ 9	6.9	+ 28	4	− 25
V4	3.7	3.7	− 0	5.8	+ 57	4.4	+ 18
V5	2.1	3.3	+ 57	4.8	+129	4.4	+195
V6	1.5	2.5	+ 67	2.5	+ 67	3.3	+ 53
AVL	0.4	1.9	+125	−0.5	−225	0.5	+ 25
AVR	−1.3	−2	− 54	−1.5	− 15	−2	− 54
AVF	1.2	1.4	+ 17	1.75	+ 5	1.3	+ 80
Q							
V1	0	0	0	0	0	0	0
V2	0	0	0	0	0	0	0
V3	0.17	0	−100	0	−100	0	−100
V4	0.016	0.03	+ 88	0.17	+750	0.18	+1000
V5	0.06	0.14	+133	0.3	+430	0.33	+450
V6	0.13	0.13	0	1	+670	0.08	− 38
AVL	0.8	1.4	+ 75	2	+150	0.67	− 16
AVR	0	0	0	0	0	0	0
AVF	0	0	0	0	0	0	0

tion around the three axes. Tracings shift from positions V1 and V2 to positions V3 and V4, thus suggesting a shift of the heart *in toto* in the thoracic cavity.

As will be seen from figure 1, alterations in the size of the amplitude reflect the distance of the epicardial surface of the heart from the thoracic wall.

In the left ventricular potential, with rotation a percentage increase of 50 per cent and 250 per cent in the R wave was produced in V5 and V6 respectively (table 3). Corresponding changes occurred in the S wave which diminished in amplitude by 50 per cent. If we take the sum of the values so produced, R in V5 and S in V1 or V2, we obtain a value greater than 35 mm.; which is one of the diagnostic criteria of left ventricular hypertrophy, whereas in the original position the total of these amplitudes was within normal limits (fig. 2).

The shift of the transitional zone is often quoted as an expression of the left or right ventricular preponderance. This shift, however, may be produced merely by change of body position (fig. 1 and 2).

With a change of body position Q waves could also be produced in the aged, and in some cases where a Q wave was already present an increase could be shown after rotation (fig. 3), suggesting a greater degree of forward rotation of the apex. This change could not be produced in the younger subjects.

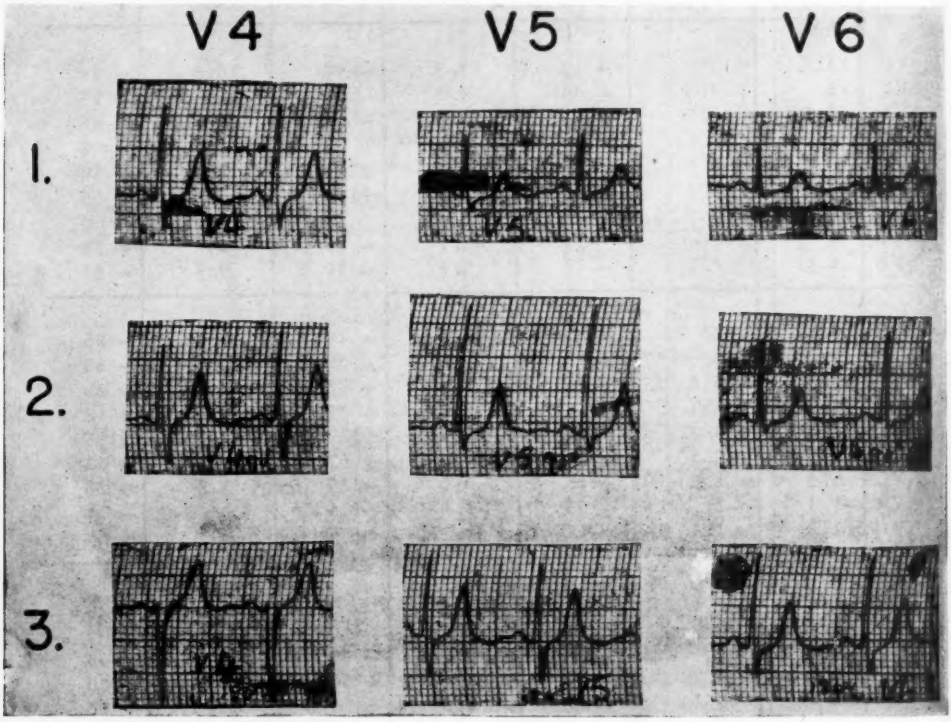


FIG. 1. Alteration in amplitude due to rotation of the body. A.G. Female. 70 yrs. B.P.130/80.
1) Lying flat on back.
2) Rotated 90° to left from 1.
3) Rotated 180° to left from 1.

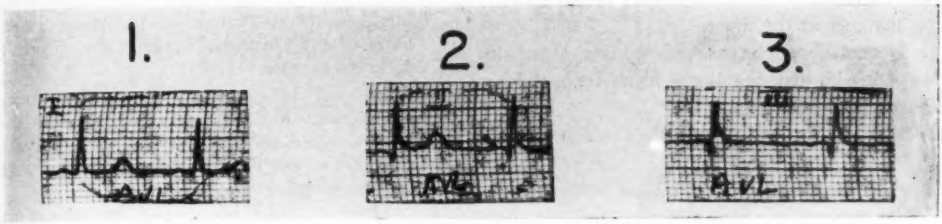


FIG. 2. Production of Q wave by body rotation in AVL. W.T. Male. 74 yrs. B.P.120/80.
1) Lying flat on back.
2) Rotated 90° to left from 1.
3) Rotated 180° to left from 1.

The RS-T segment did not change its negativity or positivity; when negative, however, it sometimes increased or decreased by 12 to 80 per cent.

The intervals and the ventricular activation time did not change with position.

When the same experiments were repeated in the younger age groups, similar striking differences in amplitude could not be produced with change of body position. This finding is in agreement with Einthoven (2), who found that one can "without much hesitation compare directly the tracings registered while lying down with those recorded while sitting."

INFLUENCE OF ANATOMIC FACTORS ON POSITION OF THE HEART

The position of the heart in the aged is influenced by factors determining not only its rotation around the three axes, but also by its position in relation to the chest wall, that is, its position in the plane.

With advancing years this position is liable to change due to:

1. *Alteration in the shape of the thorax.* With increased age the intervertebral discs shrink and the vertebral bodies diminish in height due to eccentric atrophy, especially of their anterior surfaces (osteoporosis). The height of the individual due to the forward bending of the vertebral column may thereby be reduced 6 to 8 cm. Kyphoscoliosis, even in a minor degree, has an effect in altering the position of the heart within the thorax. In the majority of cases, the heart shifts from right to left, scoliosis being to the right. More rarely is the displacement to the opposite side.

The thorax becomes more rigid due to ossification of the costal cartilages. Kyphoscoliosis, together with rigidity of the thoracic wall, leads to a different configuration of the thorax in the aged; the intercostal space is narrow and the anterior posterior diameter is longer, whereas the transverse diameter shortens and the lower circumference widens.

2. *The lower positions of the diaphragm.* In the aged the diaphragm takes up a lower position in the thorax, the space wherein the heart moves thereby being increased.

3. *Senile atrophic emphysema.* With advancing years the elasticity of the lung tissue decreases and atrophies. Due to this loss of elasticity a greater degree of freedom of movement of the heart might be encountered, resulting not only in rotation of the heart but also in a shift *in toto* within the thorax in the three different planes.

4. *Increased tortuosity and elongation of the aorta.* Dut to elongation and tortuosity of the aorta, the heart may not only rotate around the different axes but also alter its position in space using the base as a fulcrum.

CONCLUSIONS

1. The effect of anatomic changes in the thorax and its contents was discussed in relation to variations in amplitudes.

2. No evidence is available that action current changes in the aged.
3. Decrease or increase of voltage often depends on distance of the heart from the exploring electrode.

Summary

The assumption that the smaller deflections found with advancing years are due to decrease of the action current of the heart does not appear to be valid. The greater variation in amplitude in the aged can be attributed to the spatial relationship of the heart within the thorax due to the specific anatomic changes associated with advancing years. The discrepancies found in the normal electrocardiogram in the aged by other authors can be explained by the varying degree of such individual anatomic changes, and we would emphasize the caution with which voltage changes should be used as a criterion of abnormality in the interpretation of the electrocardiograph in the aged.

We would like to thank Mr. D. A. Sanford, M.R.C.P., F.R.C.S., for his critical review of the text, Mrs. D. B. Olbrich for her assistance in the statistical work, and Mrs. L. W. Cameron for her secretarial work.

References

1. Ashman, R., Ferguson, F. P., Gremillion, A. I., and Beyer, E.: The Relationship Between $\hat{A}$ and $\hat{G}$, and the Potential Variations of the Body Surface. *Am. Heart J., 29:* 697-703, 1945.
2. Einthoven, W., Fahr, G., and de Waart, A.: On the Direction and Manifest Size of the Variations of Potential in the Human Heart and on the Influence of the Position of the Heart on the Form of the Electrocardiogram. *Am. Heart J., 40:* 163-193, 1950.
3. Goldberger, E.: *Unipolar Lead Electrocardiography Including Standard Leads, Unipolar Extremity Leads and Multiple Unipolar Precordial Leads.* Lea and Febiger, Philadelphia, 1947, 2nd Edition, p. 364.
4. Graybiel, A., and White, P. D.: Inversion of the T-Wave in Lead I or II of the Electrocardiogram in Young Individuals with Neurocirculatory Asthenia, with Thyrotoxicosis, in Relation to Certain Infections, and Following Paroxysmal Ventricular Tachycardia. *Am. Heart J., 10:* 345-354, 1935.
5. Master, A. M.: *The Electrocardiogram and X-Ray Configuration of the Heart.* Lea and Febiger, Philadelphia, 1942, 2nd Edition, p. 390.
6. Nathanson, M. H.: Electrocardiographic Study of Movements of the Heart with Change of Posture. *Proc. Soc. Exper. Biol., & Med., 28:* 766-772, 1931.
7. Siegler, L. H.: Electrocardiographic Changes Occurring with Alterations of Posture from Recumbent to Standing Positions. *Am. Heart J., 15:* 146-157, 1938.
8. White, P. D., and Chamberlain, F. L.: Abnormal T-Waves of the Electrocardiogram in Young People Apparently Free of Heart Disease; Their Relation to Posture, Exercise, Infection, and Cardiac Function. *J. Clin. Investigation, 17:* 510-511, 1938.
9. Wilson, F. N., Johnston, F. D., Rosenbaum, F. F., Erlanger, H., Kassman, C. E., Hecht, H., Cotrim, N., Menezes de Oliveira, R., Scarsi, R., and Barker, P. S.: The Precordial Electrocardiogram. *Am. Heart J., 27:* 19-85, 1944.
10. Wosika, P. H., Feldman, E., Chesrow, E. J., and Myers, G. B.: Unipolar Precordial and Limb Lead Electrocardiograms in the Aged. *Geriatrics, 5:* 131-141, 1950.

Submitted for publication February 20, 1952

The senior author's address is:

Dr. O. Olbrich

Director, Geriatric Unit

General Hospital

Sunderland, England

The Potassium Content of Plasma and Red Cells in Various Age Groups

AAGE VIDEBÆK AND P. G. ACKERMANN

Previous reports in the literature pertaining to a correlation between age and blood potassium concentration are few and not in complete agreement. Hoffman and Jacobs (3) using a colorimetric method (5) for potassium determination concluded that the potassium content of the erythrocytes increases with age. The average difference observed between young and old adults (table 1) was 22 mg. per cent (5.6 mEq./l). Benetato and Ciurdariu (1), employing a titrimetric procedure for potassium analysis, studied the serum potassium values of 9 subjects below 22 years of age and of 13 individuals over 70 years. The mean serum potassium concentration in the young individuals was 21.2 mg. per cent (5.4 mEq./l) and in the old subjects 32.4 mg. per cent (8.3 mEq./l).

Following the introduction of the flame-photometric procedure for potassium determination more extensive data on the serum potassium concentration in normal human individuals have become available. In a recent study of 400 healthy subjects Elliott and Holley (2) observed a mean serum potassium concentration of 4.18 ± 0.43 mEq./l (range 3.1 to 5.5 mEq./l). No correlation between age and serum potassium content was found; the potassium values for the various age groups were, however, not reported in the publication.

The present study was undertaken with the purpose of providing data for the plasma and erythrocyte potassium concentration in young, middle-aged, and old adults.

Experimental

The investigation included 47 subjects between 25 and 97 years of age, 24 men and 23 women. The renal function estimated by plasma nonprotein nitrogen (or blood urea) was normal: The selection of individuals free from obvious kidney damage was considered of importance, since impairment of renal function may effect an increase in the plasma potassium concentration and possibly cause a reduction in the potassium content of the red blood cells (4).

Blood for potassium determination was drawn between 8:00 and 10:00 a.m. and clotting prevented by the addition of 4 mg. of heparin for each 10 ml. of blood. Potassium analyses were performed on whole blood and on plasma. For separation of the plasma from the cells the blood samples were centrifuged for thirty minutes at 3000 r.p.m.; the centrifugation in all instances was started less than fifteen minutes after the drawing of the blood. For hematocrit determinations Wintrobe's tubes were used. The hematocrit values served for calculation of the potassium content of the red blood cells from the plasma and whole blood potassium concentrations. In several instances the calculated erythrocyte potassium values were compared with values directly determined on samples of the centrifuged red cells. A 5 to 10 per cent agreement between the indirectly and directly determined erythrocyte potassium values was consistently found.

The potassium analyses were made using the Model 9200 Flame Photometer Attachment for the Beckman DU Spectrophotometer. The plasma samples were diluted 1:20 and the blood samples 1:200. After adding 3 ml. of 1 per cent sodium chloride solution for each 10 ml. of final volume the dilutions were completed with distilled water. Preliminary studies showed that at this concentration of sodium the influence on the accuracy of the potassium analysis of variations in the sodium content of the plasma or whole blood was negligible. Standards were prepared containing up to 1 mg. per cent of potassium and the same amount of sodium as the diluted samples. The standards were stored in polyethylene bottles. The potassium was determined at 768 $\mu\mu$ and at a slit width of about 0.3 mm. Two or three standards were usually run with each set of

samples and the concentration of potassium in the samples was determined by interpolation. The average difference between duplicate analyses was .5 to 1 per cent.

Results

The results of the blood potassium determinations are presented in table 1. It will be seen from the table that the plasma potassium values show a slight tendency to increase with age. A statistical analysis of the data reveals, however, that the correlation between age and plasma potassium concentration is not significant ($r = 0.25$, $t = 1.7$). No effect of age on the potassium concentration of the erythrocytes was found.

A comparison of the potassium values observed in the men and in the women showed no significant difference. Thus the mean potassium concentration of the plasma was 4.5 ± 0.4 mEq./l in the men and 4.2 ± 0.5 mEq./l in the women. The corresponding potassium values for whole blood and erythrocytes were 44.3 ± 4.1 and 94.6 ± 7.5 mEq./l in the men, and 41.4 ± 3.1 and 94.9 ± 7.3 mEq./l in the women.

TABLE 1. BLOOD POTASSIUM VALUES OF INDIVIDUALS IN VARIOUS AGE GROUPS

Age Group (years)	Mean Age (years)	Number of Individuals	Mean Hematocrit Value Per Cent	Potassium Concentration (mEq./l)						Ratio Red Cells / Plasma
				Plasma		Whole Blood		Red Cells		
				Mean	S.D.[1]	Mean	S.D.[1]	Mean	S.D.[1]	
25-49	39	11	43	4.0	0.9	42.9	5.5	95.5	9.9	23
50-69	63	10	43	4.3	0.6	42.1	4.4	89.8	7.0	22
70-79	75	9	42	4.4	0.4	44.5	5.7	93.5	5.0	22
80-89	84	10	43	4.4	0.5	43.6	1.7	97.0	4.5	23
90-97	93	7	43	4.5	0.4	43.6	2.2	94.8	3.1	21
25-97	68	47	43	4.3	0.5	43.0	5.4	94.6	6.4	22

[1] Standard deviation of the distribution

Summary

The plasma potassium concentration in normal individuals showed a tendency to increase with age. The correlation between age and plasma potassium content was not statistically significant, however. No effect of age on the potassium concentration of the erythrocytes was observed.

From the Division of Gerontology, Washington University School of Medicine, and the St. Louis City Infirmary Hospital, St. Louis, Missouri.

References

1. Benetato, G., and Ciurdariu, P.: Influence de l'Age sur le Potassium Sanguin. *Compt. rend. Soc. de biol., 132:* 177-178, 1939.
2. Elliott, H. C., and Holley, H. L.: Serum Sodium and Potassium Values in 400 Normal Human Subjects, Determined by the Beckman Flame Photometer. *Am. J. Clin. Path., 21:* 831-837, 1952.
3. Hoffman, W. S., and Jacobs, H. R. D.: The Partition of Potassium Between the Serum and Corpuscles in Health and Disease. *J. Lab. & Clin. Med., 19:* 633-644, 1934.
4. Hutt, M. P.: Effect of Disease on Erythrocyte and Plasma Potassium Concentrations. *Am. J. Med. Sci., 223:* 1766-181, 1952.
5. Jacobs, H. R. D., and Hoffman, W. S.: A New Colorimetric Method for the Estimation of Potassium. *J. Biol. Chem., 93:* 685-691, 1931.

Submitted for publication August 14, 1952

The senior author's address is:
Dr. Aage Videbæk
Strandvej 75 A
Copenhagen Ø, Denmark

Thyrotoxicosis in Aged Individuals

KURT IVERSEN

In a previous publication (5) a study was made of all patients with thyrotoxicosis admitted to the hospitals in the city of Copenhagen during the period 1938 to 1945. This study had two purposes: first to get a numerical estimate of the sudden rise in the frequency of thyrotoxicosis occurring in Denmark during the last war and, second, to evaluate on numerical basis the signs and symptoms of thyrotoxicosis as it is seen today.

The purpose of this report is to discuss the clinical picture of thyrotoxicosis in aged individuals in order to establish whether or not there are any special features of the disease in the aged people compared with the manifestations in young adults.

Thyrotoxicosis is a disease of all ages, although it is rare in childhood and puberty. Generally it is stated to be most frequent at the age of 20 to 50 years. There is a considerable difference in the age distribution now and previously, the thyrotoxic patients of today being noticeably older. Twenty years ago the disease was considered in particular to attack women of 20 to 25 years, while now it is seen more frequently in persons of both sexes over 40 years than below this age (3).

A number of studies have been published on the age distribution in thyrotoxicosis. In a review in 1909 Sattler (9) collected a large number of cases of thyrotoxicosis from the literature (altogether 3474 cases). He states that among the female patients the age-class of 21 to 25 years comprises the greatest number and that of all the female patients 71.47 per cent were found in the age group of 16 to 40 years. In 1916 Mackenzie (7) published a statistical account of 438 cases of thyrotoxicosis and he likewise found the peak of the age distribution curve in the age group 20 to 24 years. He states that the disease was exceedingly rare after the age of 55. Cookson (3) in 1939 was one of the first to state that thyrotoxicosis was seen more frequently in women over 40 (63 per cent) than below this age (37 per cent) and he emphasized the special masked forms occurring in aged individuals and the importance of recognizing these cases. In a recent report Seed and Lindsay (11) found 7 per cent above 60 years among 818 cases from the period 1925 to 1934 against 17.4 per cent among 174 cases from 1938 to 1945. In accordance with these findings Young (15) reviewed 2507 patients who had undergone surgical treatment for thyrotoxicosis and found that 3 per cent were over 60 years in 1926 compared with 12 per cent in 1940.

Material

The material to be presented here comprises all patients with thyrotoxicosis admitted to the hospitals in the city of Copenhagen during the period 1933 to 1945,, a total of 1832 patients. Patients with recurrent thyrotoxicosis were not included in this group. The average incidence of the disease in this period was found to be 44 per 100,000. On account of special circumstances in Denmark all patients with thyrotoxicosis during this period were hospitalized.

Of the 1832 patients 229 were men and 1603 women. This corresponds to 1 male per 7 females. The distribution of the patients according to sex varied in the different age groups, the female predominance being most pronounced in the younger age classes and in the group above 65 years (table 1).

The age distribution of the present material is given in figure 1. Here the age of the patients on hospitalization is taken into account,

Presented at the Second International Gerontological Congress and Fourth Annual Scientific Meeting of the Gerontological Society, Inc., September 9-14, 1951, St. Louis, Missouri. Published on a grant from the Forest Park Foundation.

TABLE 1. SEX DISTRIBUTION OF THYROTOXIC PATIENTS IN THE VARIOUS AGE CLASSES.

Age	Number of Men	Number of Women	Ratio of Men/Women
15–24	11	120	1:10.9
25–34	56	383	1: 6.8
35–44	71	436	1: 6.1
45–54	46	388	1: 6.2
55–64	40	201	1: 5.0
Above 65	5	74	1:15.0
Total	229	1603	1: 7.0

not the age at the onset of the disease. It will be noticed that the curve rises abruptly, reaching a first maximum at the age of 30 to 34 years and a next maximum at the age of 40 to 44 years. This notching of the age curve for thyrotoxic patients is not due to any actual presence of two age maxima in the thyrotoxic patients, for if the age distribution of the population in Copenhagen per 100,000 inhabitants is considered we obtain a curve with only one peak corresponding to the age class of 45 to 49 years. This curve is fairly symmetrical (fig. 2).

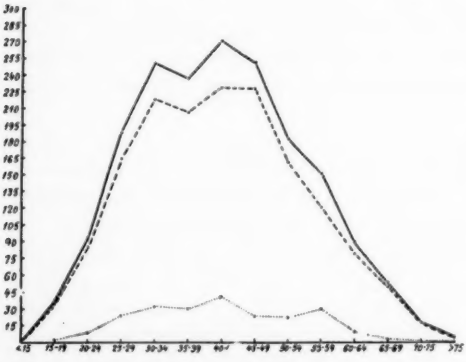


FIG. 1. Age distribution of 1832 cases of thyrotoxicosis, absolute figures.
———: entire material
- - - - -: females
.....: males

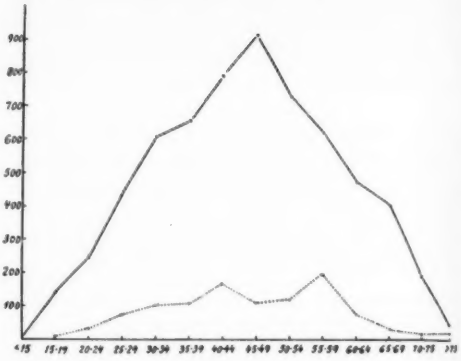


FIG. 2. Frequency of thyrotoxicosis in Copenhagen in the various age classes, calculated per 100,000 inhabitants.
———: females
.....: males

In order to illustrate the difference in the age distribution of thyrotoxicosis before and now, I have compared my own material with investigations published by Mackenzie (7) in 1916, by Sølling (13) in 1916, and by Møller (8) in 1925.

The percentage age distribution for this material is presented graphically in figure 3, from which it will be noticed that the age curve now is more elongated with a maximal plateau from 40 to 49 years and that on the whole the curve

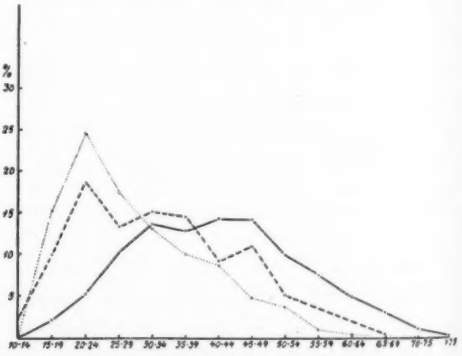


FIG. 3. Percental age distribution in thyrotoxicosis materials from 1916 (.....: Mackenzie, 7), 1916-25 (- - - - -: Sølling, 13 and Møller, 8) and the present material (———).

has shifted considerably to the right toward the older age classes.

There seem to be at least two explanations for this phenomenon. With increasing longevity the number of cases found in elderly people is also increasing; presumably, however, this considerable shift in the age of the patients is mainly due to a better knowledge of the variegated manifestations of thyrotoxicosis, including the masked forms in elderly patients. Previously the diagnosis was made chiefly on enlargement of the thyroid, exophthalmus, and tachycardia (the Merseburg triad). These classical symptoms are still seen in a part of the patients, but chiefly in the younger age classes (20 to 35 years).

Symptomatology

In the last twenty years several papers have been published in which the symptomatology of thyrotoxicosis in elderly persons has been elucidated (1, 2, 3, 4, 6, 10, 11, 12, 14). A perusal of the literature shows that the symptoms of thyrotoxicosis are basically the same in young and old, but as age increases certain differences do appear. It is generally stated that the disease in the aged shows a more oligosymptomatic form, which also will be seen in the material to be presented here. But it shows some differences in respect to the severity of the disease, which will be discussed later on and which have not been brought out in the publications quoted above.

The special investigation of the case history and clinical examination in the various age groups comprises a total of 1592 cases. The number of male patients above 60 years is rather small (12 in all) and for this reason the following detailed analysis will comprise only the female patients. Of the 1390 females suffering from thyrotoxicosis, 137, or 9.8 per cent, were above 60 years of age.

A comparison of the patients above 60 years with those below 60 has been given the following results:

The duration of the illness before admission has, on the whole, been longer for the aged patients compared with those below 60 years (table 2).

Table 2. Duration of Illness Before Admission.

Duration	Below 60 Years	Above 60 Years
0–1 year	74%	62.1%
Over 1 year	20.6%	33.5%
No data	5.4%	4.4%
Total	1253 Patients	137 Patients

A considerable loss in weight is especially noticed in the aged group (table 3). Thus,

Table 3. Loss in Weight.

Weight Loss	Below 60 Years	Above 60 Years
Over 10 Kg.	31.2%	50.4%
5–10 Kg.	32.3%	27.7%
Below 5 Kg.	15.9%	8.7%
0 Kg.	13.2%	4.4%
No data	7.4%	8.8%
Total	1253 Patients	137 Patients

more than one-half of the patients over 60 had lost more than 10 Kg. in weight. This is quite in keeping with the fact that patients of this age will suffer from their affliction longer before they submit to adequate treatment. Absence of any noticeable loss in weight is far more frequent among the younger patients, especially in the group below 30 years.

An increased tendency to sweating has been about equal in the two groups (60 per cent in the aged group against 52.4 per cent in the younger group). The same can be said about the occurrence of tremor of the hands (79 per cent against 71 per cent in the younger group) and the occurrence of diarrhoea (28.6 per cent against 25.5 per cent in the younger group). Tachycardia, i. e., a pulse rate of more than 100 beats per minute, is also seen as often among the patients over 60 years (21.2 per cent) as in those below 60 (23.5 per cent).

Looking at the frequency of the various eye symptoms a considerable difference will be found in the different age groups. Thus, exophthalmus is seen much more rarely among the aged patients (table 4). The same can

Table 4. Goiter and Eye Symptoms.

Symptoms	Below 60 Years	Above 60 Years
Goiter		
Nodular	17.5%	40.2%
Diffuse	72.4%	41.6%
None	10.1%	18.2%
Eye Symptoms		
Exophthalmus	36.9%	25.5%
Other eye symptoms	27.9%	22.6%
No eye symptoms	35.2%	51.9%
Total	1253 Patients	137 Patients

be said about the other well-known eye symptoms characteristic of Graves' disease (Dalrymple's, von Graefe's, Stellwag's, Moebius', Joffroy's, and Enroth's signs). Complete absence of Basedowian eye symptoms is found most often in the older patients.

In agreement with general experience the nodular form of goiter is considerably more frequent in the older patients. Here it has been found in two-fifths of the patients above 60 years (table 4).

Absence of any palpable enlargement of the thyroid is found especially in the older group.

The values obtained for the basal metabolic rate are the only numerical expressions for the severity of the disease. From table 5 it will

Table 5. Basal Metabolic Rate.

B. M. R.	Below 60 Years	Above 60 Years
Over +60%	24.3%	31.4%
+59 to+40%	37.5%	34.3%
+39 to +20%	30.9%	24.1%
Below +19%	5.6%	2.2%
No data	1.7%	8.0%
Total	1253 Patients	137 Patients

be seen that the higher values are more often seen in the aged patients. This finding agrees with the greater loss in weight seen in the older group.

The occurrence of auricular fibrillation and flutter (verified electrocardiographically) differs considerably in the various age classes. As was to be expected, this symptom occurs far more often in the patients past 60, being present in 25.5 per cent against 2 per cent in the younger group.

Similarly, absolute cardiac insufficiency, i. e., pronounced edema, liver stasis, hydrothorax, or ascites, is seen especially in the older patients, namely in 22 per cent against 2.6 per cent in the younger group. Undoubtedly this is connected with the circumstances that the heart already encumbered with arteriosclerosis tolerates but poorly the extra load imposed by the increased metabolism. As a rule, moreover, the disease has been present for a longer time in the older patients before adequate treatment is instituted, which also may explain the frequent occurrence of cardiac complications in this age group.

An identical calculation of the percentage occurrence of the various subjective and objective symptoms in the male thyrotoxic patients has been made, but as mentioned in the introduction, the number of patients in the elderly group is rather small and the results cannot be claimed, therefore, to be very reliable. Generally, however, they show the same features as were found for the female patients.

Summary

An analysis of all cases of thyrotoxicosis admitted to the hospitals in the City of Copenhagen during the period 1938 to 1945 has been made. Of the 1832 patients, 229 were men and 1603 women (1 male per 7 females). The percentage of patients above 60 years was 9.8 (137 females and 12 males).

Compared with the younger group, the older patients had had their disease for a longer period before admission, their basal metabolic rates were usually higher, and they had ex-

perienced a greater loss in weight.

A comparison of the signs and symptoms in the patients above 60 years with those below 60 years showed a more oligosymptomatic form of the disease in the older patients.

Typical for the aged patients were absence of exophthalmus and other Basedowian eye symptoms, a nodular form of goiter, or even absence of palpable enlargement of the thyroid. The greatest difference was seen in the cardiovascular disturbances. Auricular fibrillation and cardiac insufficiency were thus seen in 25.5 and 22.0 per cent in the older patients against 2.0 and 2.6 per cent in the younger group.

References

1. Bartels, E. C., and J. W. Kingsley, Jr.: Hyperthyroidism in Patients over Sixty. *Geriatrics, 4:* 333-340, 1949.
2. Clute, H., and N. W. Swinton: Hyperthyroidism in the Aged. *Ann. Surg., 101:* 1181-1189, 1935.
3. Cookson, H.: Toxic Goitre—with Special Reference to the Disease in Older People. *Lancet, 231:* 1363-1368, 1939.
4. Hendrick, J. W.: Hyperthyroidism in Elderly Patients. *Am. J. Surg., 52:* 466-471, 1941.
5. Iversen, K.: *Temporary Rise in the Frequency of Thyrotoxicosis in Denmark 1941-45.* Rosenkilde & Bagger, Copenhagen, 1948.
6. Lahey, F. H.: Apathetic Thyroidism. *Ann. Surg., 93:* 1026-1031, 1931.
7. Mackenzie, H.: Exophthalmic Goitre. *Lancet, 191:* 815-821, 1916.
8. Møller, E.: *Kliniske Undersøgelser over Basalstofskiftet ved Sygdomme i Skjoldbruskkirtlen.* Levin & Munksgaard, Copenhagen, 1925.
9. Sattler, H.: Basedow'sche Krankheit. *Handb. d. ges. Augenheilk. 2nd ed. 9:* 1-667, 1909.
10. Schiødt, E.: Maskeret Hyperthyreoidisme. *Nord. med., 19:* 1263-1267, 1942.
11. Seed, E., and A. M. Lindsay: Hyperthyroidism in the Aged. *Geriatrics, 4:* 136-145, 1949.
12. Swinton, N. W.: Hyperthyroidism in Elderly Patients. *S. Clin., 16:* 1547-1555, 1936.
13. Sølling, H. A.: *Kliniske Studier over Mb. Basedowiis Aetiologi, Pathogenese og Behandling.* G. E. Gad, Copenhagen, 1916.
14. Wishaw, R.: Toxic Goiter in the Middle Aged and Elderly. *Med. J. Australia, 2:* 519-521, 1946.
15. Young, T. O.: The Surgical Treatment of Thyrotoxicosis as Related to Geriatrics. *West. J. Surg., 49:* 431-438, 1941.

Submitted for publication November 12, 1951

The author's address is:

Dr. Kurt Iversen

Kommunehospital, Dept. II

Copenhagen, Denmark

Present-Day Surgical Viewpoints and Procedures in Vascular Surgery of the Aged. A Review

ROBERT A. NABATOFF

THE progress made in the field of cardiovascular surgery during the past decade has been remarkable. As a result of recent refinements in anesthesia and surgical technique, major surgical therapy is now feasible even in the aged. There are ever-increasing numbers of older individuals in our population, and since diseases of the cardiovascular system play an important role in this group, surgery of the heart and great vessels is assuming increasing importance.

It is essential for every physician to familiarize himself with the varied clinical manifestations of cardiovascular disease since he is apt to be frequently confronted by such problems. In this report, the recent advances in this field have been coordinated and reviewed, with attention focused on those conditions which have recently become amenable to surgical treatment.

VASCULARIZATION OF THE HEART

One of the leading causes of morbidity and mortality in the aged is arteriosclerosis of the coronary arteries. There have been numerous experimental attempts to improve the collateral circulation of the heart so that an effective procedure would be available clinically for cases of myocardial insufficiency. These attempts have centered around four general approaches: 1) interruption of the nerve supply of the heart, as illustrated by the work of Fauteux (7); 2) reversal of the flow of the coronary sinus, with or without an arterial shunt, such as Beck (1) has produced; 3) formation of adhesions to other structures, such as the omental grafts of O'Shaughnessy, and cardiopneumopexy (4, 22) and 4) implantation of the internal mammary artery into the myocardium (9, 33).

The technique by which the heart is denervated is still in the experimental stage. Not enough data has been accumulated to justify any valid conclusions.

Beck and McAllister (1, 18) attempted to increase the total blood supply to the heart by converting the coronary sinus into an artery and by bringing about the development of intercoronary channels. Intercoronary and extracoronary communications together reduced the mortality by one-half in dogs and also reduced the size of the infarct following ligation of the descending branch of the left coronary artery. Arterial blood was delivered to the coronary sinus by anastomosing the common carotid artery to the coronary sinus or by a free vein graft between the aorta and coronary sinus. If a vein graft is inserted between the aorta and coronary sinus and the sinus is left open so as to create an aortic-right auricular fistula, the procedure is well tolerated. Forty-seven consecutive animals were subjected to this operation without mortality, and the grafts have remained patent in 65 per cent. This procedure in itself furnished some protection against occlusion of a major artery. At a second stage, the coronary sinus is partially occluded. This 2-stage operation has protected 12 of 13 dog hearts against experimentally produced coronary occlusion.

Arterialization of the coronary sinus has already been carried out clinically in a small number of cases, and the reports thus far have been somewhat encouraging. However, it is too early to draw any conclusions. The indications, contraindications, and relative merits of this procedure have yet to be clearly defined.

Another approach to the problem of increasing the collateral coronary circulation has been made by Carter, Gall, and Wadsworth (4). A technique for cardiopneumopexy is described in which asbestos powder is used as a means of producing vascularized adhesions between the heart and lung. Comparison of specimens obtained from dogs in which ligation of the anterior descending branch of the left coronary artery had been performed after cardiopneumopexy with those from dogs in which ligation alone was performed revealed less extensive infarcts and a lower mortality in the protected series. This method of approach is now being utilized clinically. Since the prognosis of patients with coronary artery disease is often unpredictable, long-term observations are necessary before any valid conclusions can be drawn.

A different technique has been utilized by Glenn and Beal (9), who have implanted the internal mammary artery into the myocardium of the left ventricle of dogs. The animals tolerated the procedure well, and microscopic sections revealed that the myocardium reacted only slightly to the artery buried within its substance. The lumen of the implanted vessel remained patent in spite of a rather marked intimal proliferation. Since this persisted for as long as six weeks after operation and since small vessels were found in the region of the junction of the artery and myocardium, it was postulated that blood circulated through the vessel. It was feared that implantation might result in hematoma formation and fibrosis, but this did not occur.

Vineberg and Niloff (33) also described studies concerning the vascularization of the ventricular myocardium by means of left internal mammary artery implantation. An anastomosis was shown to occur between the internal mammary artery and the left ventricular circulation in from 50 to 73 per cent of the animals. The degree of protection against coronary occlusion varied according to the size of the anastomotic channels. When there is a large anastomosis, infarction and death from coronary occlusion do not occur. The operation is technically simple and it does not seem to damage the heart. This procedure has not as yet been standardized for clinical use.

Arteriosclerotic Arterial Aneurysms

With the ever-increasing older age groups in our population, the problems posed by arteriosclerotic aneurysms are becoming increasingly prevalent. Whereas luetic aneurysms occur predominantly in the thoracic aorta, arteriosclerotic lesions usually develop within the abdomen. In Kampmeier's (15) series of 73 abdominal aortic aneurysms, 57.3 per cent of the patients had syphilis. Scott (27) reported that 74 per cent of his cases were caused by syphilis and 21 per cent by arteriosclerosis. Hubeny and Pollack (11) reviewed the records of 48 cases and considered 75 per cent to be caused by syphilis, and Pratt-Thomas (25) concluded that 15 of 17 abdominal aneurysms in his series were on a luetic basis. The predominance of syphilitic lesions in these reports is evident. In recent years, however, there has been a growing recognition of the increasing numbers of arteriosclerotic abdominal aneurysms. In 1947, Blakemore (2) reported that 26 of 32 abdominal aneurysms were caused by arteriosclerosis, and in 1950, Estes (6) reported that 97 of 102 aneurysms had a similar etiology.

Kampmeier (15) reported that the duration of symptoms before death was six months or less in 61.3 per cent of 57 patients; twelve months or less in 87.7 per cent, and twelve months to three years in 10.5 per cent. Death was caused by rupture of the aneurysms in 81.6 per cent. Scott (27) stated that 70 per cent of his 96 patients were dead within thirty-six months, and Pratt-Thomas (25) reported that the average length of life after onset of symptoms was six months in 14 of his 17 cases. If a small or moderately sized abdominal aneurysm is discovered on routine examination and it is not producing symptoms, it is advisable to merely observe the lesion at frequent intervals. However, if the lesion is large, or increasing in size, or if it produces symptoms, surgical intervention is indicated. The onset of back pain is an ominous sign, and it usually indicates marked degeneration of the aneurysmal sac.

When an aneurysm involves the abdominal aorta, it usually originates just below the renal arteries. The exact reason for this is obscure, but it may be because of the change in the antero-posterior direction of the aorta at this site. This change in direction of the blood column may produce a strain on the adjacent vessel wall. The extensive arteriosclerotic changes involving the aorta have hitherto made any surgical treatment hazardous. Sporadic attempts have been made to ligate the aorta above the aneurysm, but the ligature invariably eroded the vessel wall. Furthermore, sudden ligation of the aorta usually produces arterial insufficiency in the lower extremities.

During the past few years, a method of treatment has been devised by Blakemore (3) (fig. 1). The crux of this procedure is the gradual complete occlusion of the abdominal aorta just below the renal arteries. This is accomplished by partially occluding the aorta with a rubber band which is covered with 6 to 8 layers of polythene film. The band is sutured in situ, and its displacement is prevented by the renal vessels above and the aneurysm below. The flow through the aorta is thus abruptly cut down almost completely. To hasten the coagulation of blood within

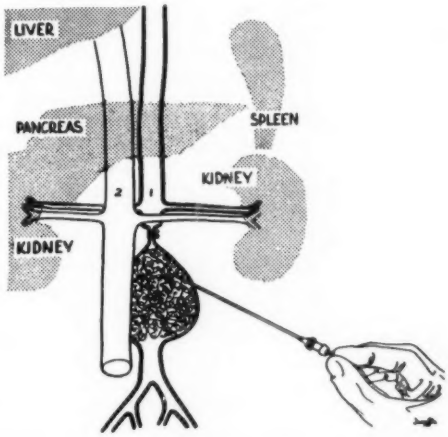


Fig. 1. A surgical technique devised by Blakemore (3) for the treatment of arteriosclerosis abdominal aneurysms. A rubber band covered with polythene film is sutured around the aorta so as to incompletely occlude it just below the renal vessels. To hasten clot formation, wire is inserted in coiled fashion into the aneurysmal sac. If the wire is heated, the clotting process is accelerated. Over a period of months, the polythene-induced fibrosis causes complete occlusion of the aorta. 1) abdominal aorta; 2) inferior vena cava.

the aneurysm, wire is inserted in coiled fashion into the sac. The clotting process is accelerated by heating the wire.

By tnis combination of methods, the aortic flow is gradually completely occluded. The constricting rubber band and the wire produce partial occlusion, and the polythene film causes a marked fibroblastic reaction which prevents erosion of the aorta and gradually produces complete occlusion. An opportunity is thus available for collateral vessels to develop.

Occlusive Arteriosclerotic Peripheral Vascular Disease

A frequent cause of morbidity in the aged is arteriosclerotic peripheral vascular disease. The lower extremities are usually involved, the upper limbs being singularly free from clinically significant arteriosclerosis. Even in the lower extremities, however, there is normally a great potential collateral circulation. This is attested to by the fact that even though the major arteries in the legs are occluded, as evidenced by absent leg and foot pulses, many of the patients in this group have no clinical symptoms of arterial insufficiency.

The fact that so many new methods of treatment are constantly being proposed is prime evidence that no type of therapy has been universally effective. Many drugs have been given orally or intravenously in an attempt to increase blood flow to the lower extremities. However, if the drug produces generalized arterial dilatation, the major increase occurs in the relatively normal extremities, whereas the diseased limb suffers by comparison. The flow to the involved extremity may actually decrease. If any method of treatment is to be successful, it must increase the blood flow specifically to the diseased area. The logical approach is to inject the drug intra-arterially. This has been carried out with some success, but whether or not any prolonged improvement occurs has yet to be demonstrated. It is difficult to evaluate any procedure until after long follow-up periods have elapsed. Spontaneous remissions of peripheral vascular disorders are common, and this probably accounts for the glowing short-term results achieved with many methods of treatment.

Lumbar sympathectomy has been advocated (5, 8) for the treatment of arteriosclerotic peripheral vascular disease. The second and third lumbar ganglia and their rami are usually excised. The advantage of this procedure is that only the nerves of an involved extremity are divided and no effects are produced elsewhere. This operation is ideal for vasopastic disorders because the sympathetic fibers maintain blood vessel tonus. In arteriosclerotic peripheral vascular disease, the predominant element is organic. However, there is usually some degree of spasm involving the smaller vessels.

Sympathectomy is especially valuable in the treatment of skin ulcerations since it results in an increased blood flow to the skin. Although several reports (5, 8) have cited improvement in intermittent claudication following sympathectomy, it is still questionable whether blood flow to the muscles is increased. In all instances, a preliminary lumbar sympathetic block with novocaine is indicated. If a favorable response is elicited, sympathectomy should be performed, even though the results of operation are sometimes quite different from those of the novocaine block.

A more direct method of treatment for occlusive arteriosclerotic vascular disease has been popularized recently in France (26). Thrombi and diseased intima are removed from occluded arteries by complete stripping of the intima. There is a well-defined cleavage plane between the intima and media, and when the intima is peeled out, an adequate lumen is reestablished. The sites of vascular occlusion are visualized preoperatively by arteriography so that the thrombi can be accurately localized. A small number of these operations have been carried out in this country, and the results here and abroad are somewhat encouraging. However, not enough time has elapsed to be certain that the involved vessels will remain patent for significant periods of time following operation.

A different approach to this problem has been made by those who have created superficial femoral arteriovenous fistulas (14, 20) in an attempt to convert the vein into an arterial channel so that more oxygenated blood will be conveyed to the distal portions of the extremity (fig. 2). This procedure has been carried out sporadically but it has never been universally accepted. The difficulty is that the vein valves have to be "forced" in order for blood to flow distally. It has never been demonstrated that this can occur. The occasional favorable result may be due to the femoral vein ligation or to the arterial stripping, which are necessary steps during the construction of the arteriovenous fistula. Until it can be demonstrated that arterial blood flows distally within the veins of the leg, no significant value can be attributed to the shunt.

Thrombo-Embolic Disease

In the past decade, many clinical and experimental investigators have been interested in the subject of thrombo-embolic disease. A great deal of research has been performed to ascertain the etiology of this disabling, and frequently fatal, complication. Many prophylactic and therapeutic measures have been advocated. In spite of this, "the incidence of venous thrombosis and its attendant sequelae has increased

FIG. 2

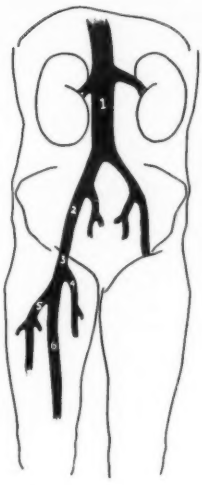


FIG. 3

FIG. 2. Schematic illustration of a superficial femoral arteriovenous fistula which has been created in an attempt to vascularize an ischemic extremity. Arterial flow theoretically enters the distal end of the superficial femoral vein, "forces" the valves, and thereby delivers oxygenated blood to the leg and foot. That this occurs has not yet been conclusively demonstrated. 1) common femoral artery; 2) common femoral vein; 3) saphenous vein; 4) deep femoral vein; 5) superficial femoral vein.

FIG. 3. The normal venous pattern in the lower abdomen and thigh. The superficial femoral vein is usually ligated at the site of its entrance into the profunda. If the thrombus extends above this level, the external iliac vein or inferior vena cava may be tied off. The common femoral vein should not be ligated because of the relatively poor collateral circulation at this level. 1) inferior vena cava; 2) external iliac vein; 3) common femoral vein; 4) saphenous vein; 5) deep femoral vein; 6) superficial femoral vein.

progressively." "In the Charity Hospital (New Orleans) where the staff has been cognizant of the frequency and seriousness of thrombo-embolism and has maintained a constant vigilance for the detection of venous thrombosis, in approximately one-half the cases of fatal pulmonary embolism no clinical evidence of an antecedent thrombus could be demonstrated" (21).

The exact mechanism responsible for the initial venous thrombosis is still obscure. If, in spite of precautionary measures, postoperative venous thrombosis does occur, anticoagulants should be administered, unless contraindicated. If this measure fails, a therapeutic vein ligation is indicated. If only one extremity is involved, a superficial femoral vein ligation is usually performed. This is not completely protective since in approximately 10 per cent of individuals, it is possible for an embolus to be propagated via the profunda femoris vein.

It is inadvisable to ligate the common femoral vein in an attempt to block the profunda vessel. There is a high incidence of untoward sequelae following this procedure because of the relatively poor collateral circulation at this level. If the phlebitic process extends above the inguinal region, an inferior vena cava ligation is indicated (fig. 3). In critically ill patients, it is possible to perform the inferior vena cava ligation under local anesthesia. Unfortunately, in a large percentage of patients the pulmonary emboli produce the first symptoms, the legs revealing no abnormalities until several days later.

The patients with venous thrombosis may develop sequelae if the process is extensive, whether or not a vein ligation is performed. If a sufficient number of veins have been destroyed or if enough valves have been damaged, significant venous insufficiency will develop. The vein ligation merely reduces further the number of functioning veins. A typical syndrome develops, exactly opposite to that which occurs in arterial insufficiency. In the former, there is rest pain and frequent night cramps (probably due to venous stasis) and massage or exercise provides relief. In arterial disease, the intermittent claudication which occurs with exercise is usually relieved by rest.

If the sequelae of deep venous thrombosis (edema, rest pain, eczema, pigmentation, and ulceration) are treated early, excellent results may be anticipated. The proper use of elastic bandages, frequent elevation, and exercise may be sufficient to produce adequate collateral venous channels. If the process is extensive or of long standing, these conservative measures are usually inadequate, and surgical therapy may be necessary. Sympathectomy, superficial femoral or popliteal vein ligation may be performed. Each procedure has given satisfactory results in properly selected cases. Sympathectomy has been effective in those few cases in which vasospasm plays the dominant role. This can be ascertained by preliminary sympathetic block. If venograms demonstrate incompetent valves to be responsible for the venous stasis, a popliteal or femoral vein ligation should be carried out, the decision depending on the vein involved.

VARICOSE VEINS

In previous years it was not considered feasible to treat varicose veins surgically in the aged because the anesthesia and bed rest required were considered

hazardous. The use of injection therapy alone has been shown to be totally inadequate. It is impossible to produce accurate effects with a sclerosing solution, and even if thrombosis of the vein is produced, the vessel frequently recanalizes. It is now feasible to perform multiple saphenous vein ligations plus an adequate stripping procedure under local anesthesia, and the patient can be immediately ambulatory (19). This minimizes the postoperative complications, which have been largely caused by venous thrombosis and subsequent pulmonary embolization.

The crux of effective treatment is the elimination of all incompetent perforator vessels and not the stripping of varicose vein segments which are secondary to these "blowouts." The success of operation therefore depends proportionately upon the ability of the surgeon to localize all incompetent vessels preoperatively. The varicosities can be delineated just prior to operation with a new marking ink (19). This greatly facilitates the surgical exposure of all incompetent vessels. After a procedure of this type, the residual varices are few, if any. Therefore, practically no postoperative injections of a sclerosing solution are necessary.

It is apparent that great strides have been made in the field of cardiovascular surgery during the past decade. At the present time, there is experimental work in progress which should lay the groundwork for even more striking advances. Blood vessel grafts have been uniformly successful when used to replace arterial defects in dogs (10, 12, 17, 23, 24, 31, 32). Segments of large arteries, such as the aorta, have been excised and replaced with arterial homografts or venous autografts. Such grafts have already been successful clinically. It has even been feasible temporarily to replace the dog heart partially or completely with an extracorporeal pump (13, 16, 28, 29, 30), thus making it possible surgically to open and close the heart in a dry field. Such an apparatus has already been successfully used for as long as two hours. When these pumps become perfected, it will be possible to perform truly corrective operations upon the heart. The patients would thus be restored to a normal status, both anatomically and physiologically.

Summary

Since there are ever-increasing numbers of older individuals in our population, physicians are frequently confronted by the problems posed by cardiovascular disease. This report is a critical analysis of recent developments in the surgical treatment of myocardial ischemia, arterial aneurysms, arteriosclerotic peripheral vascular disease, thrombo-embolic disease, varicose veins, and the postphlebitic syndrome. As a result of these recent advances in diagnosis and treatment, many disease processes in the aged, which have hitherto been considered hopeless, have now become amenable to surgical therapy.

References

1. Beck, C.: Revascularization of the Heart. *Surgery, 26:* 82-88, 1949.
2. Blakemore, A.: The Clinical Behavior of Arteriosclerotic Aneurysm of the Abdominal Aorta: A Rational Surgical Therapy. *Ann. Surg., 126:* 195-207, 1947.
3. Blakemore, A.: Progressive Constrictive Occlusion of the Abdominal Aorta with Wiring and Electrothermic Coagulation. *Ann. Surg., 133:* 447-461, 1951.
4. Carter, B., Gall, E., and Wadsworth, C.: An Experimental Study of Collateral Coronary Circulation Produced by Cardiopneumopexy. *Surgery, 25:* 489-509, 1949.
5. Coller, F., Campbell, K., Harris, B., and Berry, R.: The Early Results of Sympathectomy in Far-Advanced Arteriosclerotic Peripheral Vascular Disease. *Surgery, 26:* 30-40, 1949.
6. Estes, J., Jr.: Abdominal Aortic Aneurysm: A Study of 102 Cases. *Circulation, 2:* 258-264, 1950.
7. Fauteux, M.: Surgical Treatment of Angina Pectoris. *Ann. Surg., 124:* 1041-1044, 1946.
8. Gerber, L., McCune, W., and Eastman, W.: Lumbar Sympathectomy for Arteriosclerotic Gangrene. *Arch. Surg., 59:* 1234-1243, 1949.
9. Glenn, F., and Beal, J.: The Fate of an Artery Implanted in the Myocardium. *Surgery, 27:* 841-847, 1950.
10. Gross, R., Bill, A., Jr., and Peirce, E.: Methods for Preservation and Transplantation of Arterial Grafts. *Surg. Gynec. & Obst., 88:* 689-701, 1949.
11. Hubeny, M., and Pollack, S.: Saccular Abdominal Aortic Aneurysm: Analysis of 48 Cases. *Am. J. Roentgenol., 43:* 385-393, 1940.
12. Johnson, J., Kirby, C., Greifenstein, F., and Castillo, A.: The Experimental and Clinical Use of Vein Grafts to Replace Defects of Large Arteries. *Surgery, 26:* 945-956, 1949.
13. Jongbloed, J.: The Mechanical Heart-Lung System. *Surg. Gynec. & Obst., 89:* 684-691, 1949.
14. Jordan, P.: Arteriovenous Shunts for Revascularization of Ischemic Limbs. *J. Michigan M. Soc., 48:* 1011-1012, 1949.
15. Kampmeier, R.: Aneurysm of the Abdominal Aorta: A Study of 73 Cases. *Am. J. M. Sc., 192:* 97-109, 1936.
16. Leeds, S., Gray, N., and Cook, O.: Prolongation of Occlusion of the Cavae in Dogs by Diversion of the Circulation. *Surg. Gynec. & Obst., 91:* 399-404, 1950.
17. Macpherson, A., Nabatoff, R., Deterling, R., Jr., and Blakemore, A.: Observations on the Use of Preserved Venous Homografts in Experimental

Aortic Defects. *Arch. Surg., 63:* 152-161, 1951.

18. McAllister, F., Leighninger, D., and Beck, C.: Revascularization of the Heart by Vein Graft from Aorta to Coronary Sinus. *Ann. Surg., 133:* 153-165, 1951.
19. Nabatoff, R.: Importance of Adequately Excising all Incompetent Perforator Veins in the Surgical Treatment of Varicose Veins. Use of a New Marking Ink to Delineate the Varices. *New York State J. Med., 52:* 563-565, 1952.
20. Nabatoff, R.: The Creation of Superficial Femoral Arteriovenous Shunts for the Revascularization of Ischemic Limbs. To be published.
21. Ochsner, A., DeBakey, M., DeCamp, P., and DaRocha, E.: Thrombo-Embolism. *Ann. Surg., 134:* 405-419, 1951.
22. O'Shaughnessy, L.: An Experimental Method of Providing a Collateral Circulation to the Heart. *Brit. J. Surg., 23:* 665-670, 1936.
23. Paolucci, R., and Tosatti, E.: Homografts of Aorta Preserved in Alcohol. *J. Internat. Coll., Surgeons, 14:* 257-261, 1950.
24. Peirce, E., Rheinlander, H., Moritz, A., Gross, R., and Merrill, K.: Transplantation of Aortic Segments Fixed in 4 Per Cent Neutral Formalin. *Am. J. Surg., 78:* 314-323, 1949.
25. Pratt-Thomas, H.: Aneurysm of the Abdominal Aorta. An Analysis of 17 Cases. *J. South Carolina M. A., 40:* 251-253, 1944.
26. Reboul, H., and Laubry, P.: Endarteriectomy in Treatment of Chronic Endarteritis Obliterans of Limbs and Abdominal Aorta. *Proc. Roy. Soc. Med., 43:* 547-552, 1950.
27. Scott, V.: Abdominal Aneurysms. A report of 96 Cases. *Am. J. Syph., Gonor. & Ven. Dis., 28:* 682-710, 1944.
28. Sewell, W., Jr., and Glenn, W.: Experimental Cardiac Surgery. Observation on the Action of a Pump Designed to Shunt the Venous Blood Past the Right Heart Directly into the Pulmonary Artery. *Surgery, 28:* 474-494, 1950.
29. Sirak, H., Ellison, E., and Zollinger, R.: Cardiotomy into an Empty Left Ventricle. *Surgery, 28:* 225-234, 1950.
30. Stokes, T., and Gibbon, J., Jr.: Experimental Maintenance of Life by a Mechanical Heart and Lung During Occlusion of the Venae Cavae Followed by Survival. *Surg. Gynec. & Obst., 91:* 138-156, 1950.
31. Swan, H., Robertson, H., and Johnson, M.: Arterial Homografts. *Surg. Gynec. & Obst., 90:* 568-579, 1950.
32. Touroff, A., and Nabatoff, R.: The Experimental Use of Long Fresh Vein Grafts to Replace Aortic Defects in Dogs. To be published.
33. Vineberg, A., and Niloff, P.: The Value of Surgical Treatment of Coronary Artery Occlusion by Implantation of the Internal Mammary Artery into the Ventricular Myocardium. *Surg. Gynec. & Obst., 91:* 551-561, 1950.

Submitted for publication March 11, 1952

The author's address is:

DR. ROBERT A. NABATOFF

1150 PARK AVENUE

NEW YORK 28, NEW YORK

The Wechsler-Bellevue Performance of White Males Past Age 50

BERNARD BERKOWITZ

THERE have been varied studies on the Wechsler-Bellevue achievement of individuals of advanced maturity. Several were concerned with individuals showing some intellectual or emotional aberrations (1, 2, 4, 8, 9, 13, 14). Others, recognizing the paucity of data on so-called normal individuals of advanced maturity, offered data on the small samples they had obtained (3, 6, 7, 11, 12). Even Wechsler (15) in his standardizing study reported comparatively few cases. Although at least 190 adults aged 50 or more were used in standardizing samples, results for only 81 beyond the age of 50 are reported. The largest sample in the age range above 50 has been reported by Copple (5). He reported on 201 white males above the age of 50, with only 10 above the age of 59.

The present study is preliminary to establishing a reliable and valid method to discriminate accelerated deficit in the aged from normal senescence. Its purpose is to establish norms for the sub-tests of the Wechsler-Bellevue in the age groups above 50. Our sample comprises 1233 subjects tested at the Bath Veterans Center in New York State; 1026 were 50 or more years old; 207 were between the ages of 20 and 49. They were all white males, and each had been given all 11 sub-tests.

In the above 50 group, 193 were patients in a general medical and surgical hospital and were tested as part of the routine work-up for psychogenic reactions, psychiatric diagnosis, or were being considered for physical or vocational rehabilitation; 833 were members of a veterans' domiciliary. These veterans because of age, physical deficit, social or emotional problems were unable to make an adequate adaptation in their home communities. They were all capable of self care but needed a sheltered environment. They were chosen in alphabetical order from the total domiciliary roster.

The above 50 year old sample had the following social characteristics: 31 per cent had been reared in a rural environment; 19 per cent were foreign born; 21 per cent had been skilled workers and 63 per cent unskilled workers; 3 per cent had held managerial positions while 7 per cent had been self employed; 6 per cent had been engaged in a profession.

The educational level of the above 50 sample closely approximates the level of education of the United States adult population (15, page 105; 16). Of the sample 4.69 per cent were illiterates; 43.58 per cent had less than an 8th grade education; 18.68 per cent were 8th grade graduates; 6.85 per cent were high school graduates; 18.99 per cent had some high school education but had not graduated; 2.93 per cent had completed a college education; 4.28 per cent had some college education but no degree.

RESULTS

All subjects were classified into age groups of 5 year intervals. For each age group the mean I.Q. and its S.D. were computed using Wechsler's (15) tables. The results are given in table 1. The mean for each age group (with the exceptions of 30 to 34, 75 to 79, 80 to 84) approximate 100, and the variance is approximately that reported by Wechsler for his standardizing population. For each sub-test for each age group, the mean raw score and its standard deviation were computed. The results are given in tables 2 and 3. The t value between all age groups for each sub-test was computed.

In general, the means of contiguous age groups were not significantly different at the 5 per cent level of confidence, unless one of the means was in the range 50 to 65, where the N is large. Every sub-test shows some differ-

TABLE 1. MEAN FULL SCALE I.Q. FOR EACH AGE GROUP AND ITS STANDARD DEVIATION

Age	N	Mean I.Q.	S.D.
20-24	24	99.23	11.10
25-29	52	99.15	14.15
30-34	33	103.80	13.70
35-39	41	100.25	15.20
40-44	25	99.90	15.70
45-49	32	101.85	15.95
50-54	216	100.40	13.16
55-59	404	99.95	12.88
60-64	278	100.30	13.58
65-69	64	99.81	14.10
70-74	33	101.73	14.40
75-79	24	104.71	14.65
80-84	7	95.85	14.60

ences between the means of two age groups that was significant at the 1 per cent level of confidence and some at the 5 per cent level of confidence. Digit Symbol had the largest number of differences between means that were significant at the 1 per cent or 5 per cent level of confidence. Following it in order are: Block Design, Picture Arrangement, Picture Completion, Similarities, Comprehension, Object Assembly, Arithmetic, Information, Digit Span, and Vocabulary.

Copple (5) has shown that mild psychiatric diagnoses have no appreciable effect on the mean level of achievement or the change with age. From our sample we matched for age 201 cases having some psychiatric diagnosis with subjects having no psychiatric diagnosis. For each sub-test the difference between the means was calculated. The differences were significant at a P level above 20 per cent in 1 sub-test and 40 per cent and above in the other 10 sub-tests.

To determine the effect of institutionalization, 133 domiciliary patients were matched for age with patients in the transient hospital group. For each sub-test the difference between the means was calculated. The differences were significant at a P level that was at the 10 per cent level for 1 test, between 20 per cent and 45 per cent for 5 tests and above 50 per cent for the other 5. A correlation between Wechsler-Bellevue I.Q. and age at institutionalization was .03 $\pm$ .06 for a sample of 300 cases. The correlation between length of stay in the institution and Wechsler-Bellevue I.Q. was .05 $\pm$ .06.

TABLE 2. MEANS AND STANDARD DEVIATIONS OF SUBTESTS

Verbal Subtests

Age	N	Information		Comprehension		Digit Span		Arithmetic		Similarities		Vocabulary	
		M	S.D.	M	S.D.	M	S.D.	M	S.D.	M	S.D.	M	S.D.
20-24	24	13.75	3.28	12.04	3.23	11.04	2.04	6.58	1.92	11.67	3.45	22.66	4.57
25-29	52	13.40	3.73	11.90	3.73	10.23	1.95	6.88	2.22	10.73	3.70	21.94	5.45
30-34	33	14.88	3.75	12.03	3.38	9.97	2.38	7.09	2.53	12.42	3.88	24.89	5.30
35-39	41	13.22	4.48	11.12	3.85	10.80	2.39	6.85	2.82	9.93	4.90	22.42	7.48
40-44	25	12.64	4.30	10.04	3.44	10.24	2.20	6.67	2.57	9.08	3.87	21.88	6.71
45-49	32	14.00	4.68	10.81	4.28	9.56	2.25	6.55	3.15	9.69	4.78	22.11	7.05
50-54	216	14.66	4.18	10.81	3.14	9.58	2.04	6.51	2.12	9.61	3.65	22.74	7.27
55-59	404	13.02	5.04	9.47	3.05	9.60	1.85	5.78	2.09	7.94	3.89	21.67	8.23
60-64	278	12.70	4.33	8.59	3.69	9.20	2.20	5.74	2.44	6.78	3.76	20.17	8.31
65-69	64	13.14	5.49	9.52	4.39	8.87	2.00	5.32	2.41	7.57	4.84	21.90	8.06
70-74	33	13.61	5.62	9.79	4.68	9.24	1.83	5.30	2.44	7.73	4.26	22.87	8.44
75-79	24	14.14	5.29	9.24	4.26	9.35	2.07	6.33	2.37	8.81	4.62	22.24	9.15
80-84	7	10.14	5.82	7.57	4.70	9.14	2.15	5.00	2.26	6.14	4.80	19.64	8.18

TABLE 3. MEANS AND STANDARD DEVIATIONS OF SUBTESTS

Performance Subtests

Age	N	Picture Arrangement		Picture Completion		Object Assembly		Block Design		Digit Symbol	
		M	S. D.	M	S. D.	M	S. D.	M	S. D.	M	S. D.
20-24	24	12. 17	3. 86	10. 74	2. 21	18. 74	3. 17	21. 18	6. 15	37. 00	7. 07
25-29	52	9. 90	4. 82	10. 39	2. 59	18. 65	3. 82	20. 82	8. 43	36. 90	11. 01
30-34	33	9. 97	3. 28	10. 88	2. 22	19. 00	3. 75	21. 38	7. 02	35. 91	10. 43
35-39	41	9. 70	4. 81	10. 08	2. 38	17. 80	3. 41	17. 18	7. 90	34. 50	12. 20
40-44	25	8. 00	4. 18	10. 04	2. 72	16. 75	3. 03	15. 40	8. 14	28. 20	10. 03
45-49	32	7. 76	3. 73	10. 14	2. 67	16. 52	4. 52	14. 50	7. 84	26. 11	11. 57
50-54	216	6. 48	2. 88	9. 62	2. 19	16. 14	3. 60	14. 35	6. 07	24. 63	7. 69
55-59	404	5. 74	2. 54	8. 83	2. 42	15. 10	3. 83	12. 82	5. 71	20. 71	9. 01
60-64	278	5. 38	2. 84	8. 36	2. 44	14. 36	3. 77	11. 59	4. 66	19. 54	8. 18
65-69	64	4. 76	3. 01	8. 31	2. 83	14. 13	4. 36	10. 43	6. 12	17. 58	8. 65
70-74	33	4. 13	2. 96	8. 26	2. 51	14. 48	4. 81	9. 83	7. 93	18. 00	9. 78
75-79	24	5. 29	2. 47	7. 88	2. 46	15. 35	4. 77	8. 82	6. 17	15. 65	8. 49
80-84	7	2. 57	2. 55	7. 29	2. 91	9. 00	4. 09	6. 14	5. 79	6. 71	7. 28

Using a formula suggested by Kuder and Richardson (10) the standard error of estimates was computed for each age group for each sub-test, for both Wechsler's standardizing population and our population up to age 59. Any differences between the two populations for homologous sub-tests and age periods were in the second decimal only and not significant.

Discussion

We can assume that two groups which show the same mean and variance on any psychologic test are similar in the psychologic factors measured by that test. If we assume that our sample below age 59 is as representative of the general population as is Wechsler's standardizing group, there is a reasonable assumption that the sample above 60 is not atypical. The effect of institutionalization and the type of disability does not seem to affect the level achieved by any age group.

Neither Wechsler (15) nor Copple (5) report their raw score means. To compare the trends of our sample with their results up to age 59, it was necessary to compute the mean weighted score for each sub-test for each age group. Although there were occasional discrepancies from one curve to the other, in general they all agreed. Information and Vocabulary (Wechsler does not report on vocabulary) changes seemed to have no relationship to changing age levels. Digit Symbol, Block Design, and Picture Arrangement declined in efficiency most markedly with increase in age. Object Assembly and Picture Completion showed moderate declines in level of performance with increasing age. Digit Span, Arithmetic, Comprehension, and Similarities all showed some gradual decrease in efficiency from the base group (20 to 24) to the oldest group (55 to 59).

Weighted score means are probably less desirable than raw score means to indicate changes that occur with age. Changes in raw score, with age, that are significant at the .01 level of confidence could be obscured if only the mean of individual weighted scores were obtained. For Picture Arrangement the difference between the mean raw score at age 50 to 54 and the mean raw score at age 55 to 59 is .74. This difference, which can easily be

within the limits of the same weighted score, is significant at the .01 level of confidence. Differences between mean raw scores that would fall within the same weighted score (Wechsler's table, 15) and still be significant at the .01 level of confidence were found in every sub-test except Vocabulary. In the age groups 20 to 59 the mean weighted score was often different than that which would be obtained by converting the mean raw score into a weighted score by interpolation.

In the age groups 20 to 59, the trends noted for our sample were similar, whether the criterion was mean weighted score or mean raw score. The changes noted in the age groups above 60 and their comparison with age groups below 60 were made on the basis of mean raw scores.

For the age groups above 60, Digit Symbol, Block Design, and Picture Arrangement are the sub-tests that show the most marked decline with increasing age. Information and Vocabulary still continue to show no trend that is related to change in age. Picture Completion still shows some decrease in efficiency with increasing age. There is some indication of a small change with age for Arithmetic. But for Object Assembly, Similarities, Comprehension, and Digit Span, there is more marked resistance to further decline in efficiency with increasing age up till the eighth decade. For Object Assembly the mean achievement in the age range 70 to 79 is superior to the mean achievement in the age range 60 to 69. For Comprehension the mean achievement in the age range 65 to 74 is superior to the mean achievement in the age range 55 to 64. The mean achievement in the age range 75 to 79 is superior to that of the age range 60 to 64. For Digit Span the mean achievement in the age range 70 to 79 is superior to that in the age range 60 to 69. For Similarities the mean achievement increases progressively from age 60 to 79.

"Resistance to decline" is characteristic of change with age on all sub-tests of the Wechsler-Bellevue. It may probably be found in the measurement of all psychologic functions that decrease in efficiency with increasing age. It is shown in table 4 where the changes on all sub-tests are compared. We find that the decrease in efficiency during the twenty years preceeding age 60 are greater than any decrease in efficiency twenty years following age 60. This differential decrease in efficiency between the two age groups might be a function of the particular age groups used. However, table 4 also indicates that if we use the

TABLE 4. ABSOLUTE MEAN CHANGE BETWEEN SOME AGE PERIODS FOR EACH SUBTEST

Age Periods	Picture Arrangement	Picture Completion	Object Assembly	Block Design	Digit Symbol	Information	Comprehension	Digit Span	Arithmetic	Similarities	Vocabulary
40-59	−3.96	−1.25	−2.70	−4.36	−13.79	− .20	−1.65	−1.20	−1.07	−1.99	− .75
60-79	− .45	− .95	+ .25	−4.00	− 5.06	+1.12	− .23	− .25	+ .55	+ .87	+ .57
45-49	−2.26	−1.21	−1.65	−2.58	− 7.49	+ .38	− .57	− .64	− .89	−1.14	− .21
60-74	−1.61	− .57	− .62	−2.99	− 2.71	+ .59	+ .32	− .36	− .48	− .21	+1.20

− indicates decrease in mean achievement from beginning to end of age period

\+ indicates increase in mean achievement from beginning to end of age period

age groups fifteen years before 60 and fifteen years after 60, a similar relationship is demonstrated. In this latter comparison, only Block Design shows a greater decrease in efficiency in the period past 60 than in the period before 60.

Summary

1. The mean raw scores for all 11 sub-tests of the Wechsler-Bellevue are given for a white male veteran population in the age range of 20 to 84.
2. Some sub-tests, notably Digit Symbol, Block Design, and Picture Arrangement, decrease progressively in mean achievement with increasing age.
3. Some tests, notably Object Assembly, Comprehension, Digit Span, and Similarities decrease in mean achievement with increasing age only till the sixth decade. From then till the eighth decade there is probably no further decrease in mean achievement.
4. All sub-tests tend to show a "resistance to decline" with increasing age. For any subtest, after decline with age has set in, the mean decrease in achievement per unit of time is greater in the age ranges before 60 than for the same unit of time in the age ranges past 60.

Reviewed in the Veterans Administration and published with the approval of the Chief Medical Director. The statements and conclusions published by the author are the results of his own study and do not necessarily reflect the opinion or policy of the Veterans Administration.

References

1. Bensberg, G. J., and Sloan, W.: A Study of Wechsler's Concept of "Normal Deterioration" in Older Mental Defectives. *J. Clin. Psychol., 6:* 359-362, 1950.
2. Botwinick, J., and Birren, J. E.: The Measurement of Intellectual Decline in the Senile Psychoses. *J. Consult. Psychol., 15:* 145-153, 1951.
3. Chesrow, E. J., Wosika, P. H., and Reinitz, A. H.: A Psychometric Evaluation of Aged White Males. *Geriatrics, 4:* 169-177, 1949.
4. Cleveland, S. E., and Dysinger, D. W.: Mental Deterioration in Senile Psychoses. *J. Abnorm. & Social. Psychol., 39:* 368-372, 1944.
5. Copple, G. E.: Senescent Decline on the Wechsler-Bellevue Intelligence Scale. Unpublished Doctor's dissertation. Univ. Pittsburgh, 1948.
6. Fox, C., and Birren, J. E.: Intellectual Deterioration in the Aged. *J. Consult. Psychol., 14:* 305-310, 1950.
7. Fox, C., and Birren, J. E.: The Differential Decline of Subtest Scores of the Wechsler-Bellevue Intelligence Scale in 60-69 Year Old Individuals. *J. Genet. Psychol., 77:* 313-317, 1950.
8. Goldman, R., Greenblatt, M., and Coon, G. P.: Use of the Bellevue-Wechsler Scale in Clinical Psychiatry with Particular Reference to Cases with Brain Damage. *J. Nerv. & Ment. Dis., 104:* 144-179, 1946.
9. Johnson, L. C.: Wechsler-Bellevue Pattern Analysis in Schizophrenia. *J. Consult. Psychol., 13:* 32-33, 1949.
10. Kuder, G. F., and Richardson, W. M.: The Theory of the Estimation of Test Reliability. *Psychometrika, 2:* 151-160, 1937.
11. Lewinski, R. J.: Vocabulary and Mental Measurement. A Quantitative Investigation and Review of Research. *J. Genet. Psychol., 72:* 247-281, 1948.
12. Madonick, M. J., and Solomon, M. A.: The Wechsler-Bellevue Scale in Individuals Past Sixty. *Geriatrics, 2:* 34-40, 1947.
13. Rabin, A. I.: Wechsler-Bellevue Test Results in Senile and Arteriosclerotic Patients. *Psychol. Bull., 39:* 510. (Abstract), 1942.
14. Rabin, A. I.: Psychometric Trends in Senility and Psychoses of the Senium. *J. Genet. Psychol., 32:* 149-162, 1945.
15. Wechsler, D.: The Measurement of Adult Intelligence (3rd Ed.) Williams and Wilkins, Baltimore, 1944.
16. Educational Characteristics of the Popoulation of the United States by age: 1940. Washington, D. C., Bureau of the Census, Series P-19, no. 4, 1943.

Submitted for publication November 20, 1951

The author's address is:
Dr. Bernard Berkowitz
Veterans Administration Center
Bath, New York

Retirement and the Professional Worker

ROBERT J. HAVIGHURST AND ETHEL SHANAS

For some years the authors and their colleagues have been making a series of investigations of attitudes toward retirement and the retirement procedure of persons in a variety of occupational groups. The present article reports on the problems of retirement as these confront the professional worker. In a subsequent paper a detailed report will be made of the experiences in retirement of groups of men in four professions: schoolteachers, ministers, Y. M. C. A. secretaries, and physicians.

With the recent rapid increase in the number of older people and the almost concomitant lowering of retirement ages, retirement has emerged as one of the major problems which older people must face. Retirement is a problem to older people because work is so important in our lives. Although most of us work in order to support ourselves and our families, work has other meanings as well. To understand the phenomenon of retirement one must first consider the variety of meanings assigned to work.

The Meanings of Work

An historian's answer to the question of the meaning of work has been given by an Italian, Adriano Tilgher (6), who traced the attitudes of people toward work through the writings of religious leaders, poets, philosophers, and in more recent times, social theorists.

"In the sweat of thy face shalt thou earn thy bread," said Jehovah to Adam, after Adam had eaten the fruit of the Tree of Knowledge. The consequent notion of work as a punishment for original sin, a heavy burden, persisted among the ancient Hebrews and was held, too, by the ancient Greeks. The Greek word for work was taken over into the Latin as *poena*—"sorrow."

For the Greeks, work was a hard, burdensome thing to be shunned if possible. They welcomed laborsaving inventions as a means of easing the burden of work. Antipater of Thessalonica, a Greek poet of Cicero's time, acclaimed the use of the water wheel for grinding grain, since it gave freedom from work to female slaves. He wrote:

> Cease from grinding, ye women who toil at the mill; sleep late, even if the crowing cocks announce the dawn. For Demeter has ordered the nymphs to perform the work of your hands, and they, leaping down on top of the wheel turn its axle, which, with the revolving spokes, turns the heavy Nisyrian millstones. We taste again the joys of the primitive life, learning to feast on the product of Demeter without labor.

In contrast to the view of work as a burden, in the centuries before the coming of Christ, the Persian followers of the prophet Zoroaster proclaimed a more positive meaning of work. They believed that the man who works is in league with Ahura Mazda, the spirit of goodness, against the forces of Ahriman, the spirit of evil.

Medieval Christianity carried on the Hebrew concept of work as an instrument of expiation and purification whereby man could redeem his soul and fit himself for Heaven. The voice of St. Benedict rings down through the Middle Ages, "Work, do not despair," and his Order set an example by devoting one-third of the waking day to work.

Gradually as the attention of men shifted from the future world to the present one, work came to have positive values as both a right and duty. While Martin Luther saw work as a way of serving God, the best way to perform such service was to do most perfectly the work of one's occupation. From this conception, the German word *Beruf,* or "calling" took on a religious color. Every man was in a way divinely "called" to his occupation.

As the eighteenth century inaugurated the Age of Reason, work came to be viewed even more positively. Voltaire saw history as progress, to be won by work. At the end of his *Candide,* the three heroes settle down on the banks of the Bosphorus to find peace in work. Pangloss says, "Man was not born for repose." Martin says, "Yes, work without arguing about it is the only way to make life endurable." And

Candide closes with the words, "Let us cultivate our garden."

Adam Smith saw in work the beginning of all wealth. The wealth of a nation consisted of the quantity of labor it could produce. Work is then seen as the controlling factor in the success or failure of mankind.

The nineteenth century saw the glorification of work. Under the stimulus of European industrialization there was universal conscription in the army of labor. Even the primitive South Sea islanders were put to gathering coconuts to trade for the goods of an industrial civilization.

Kant blessed these ideas by arguing that knowledge is work. To know is to do, to act, to produce. And another German philosopher, Fichte, proclaimed: "In activity alone can man find happiness." Work came to be regarded as its own reward, bringing to man the joys of strength and activity. Goethe summed up this attitude in his story of Faust, who spent his lifetime seeking happiness in many ways and never quite finding it until as an old man he set to work to drain a marshy land, so that people might *live and work* there. In this act he found the highest happiness.

With Goethe we see work almost as a privilege—as the best thing life has to offer. Fourier, the French social theorist, so conceived the role of work in his ideal society. He said that in the past men worked because of three reasons: poverty, avarice, or coercion by society or religion. But in the future ideal society, men will run to work as to a festival. Everyone will be assured of a livelihood and will do the sort of work which he likes best. Servile or unpleasant tasks will be performed by everyone, in rotation.

The idea of work as a pleasure in itself has never been advanced as the basic meaning of work for the entire population in any actual society. It has been recognized, however, that some people, especially artists, enjoy their work for its own sake. Veblen postulated an "instinct of workmanship" which suggested that men might work for the rewards inherent in doing a good job.

In the newest forms of social and economic order, the Communist and Fascist states, work is proclaimed as obligatory for all and as an activity to be controlled by the state. "He who works not, eats not."

These attitudes toward work which have prevailed at one time or another in the history of Western civilization have all left their residues in modern man. For contemporary man, work is not only a way of earning a living, but a duty and a right and, less clearly and universally, a privilege.

The meaning of work to the individual becomes most clear when he retires. No longer employed, the individual finds it necessary to substitute other modes of activity for employment. Ideally, these other activities should provide the gratifications which have been associated with work.

Types of Retirement

Retirement from employment, something almost unknown a half century ago, is becoming increasingly prevalent in this country. More people are living longer and the concept of retirement as a reward for a lifetime of effort —a carry-over from earlier days when very few retired—is still with us. Actually, older workers practice a variety of modes of retirement, some of which do not involve complete separation from work.

The most prevalent type of retirement in this country is arbitrary retirement at a fixed age. This practice tends to be adopted wherever the employing organization is large and impersonal, with a need for general rules of personnel procedures, and the good of the organization or institution is considered as more valuable than the good of any one or few individuals in it.

Retirement at a fixed age is generally required of: school and college teachers (unless there is no pension system for them); executive and white-collar workers in large or medium-sized corporations; civil servants; and workers in certain professions, such as Y. M. C. A. secretaries. Increasingly, this is the retirement pattern which has been adopted at the "work-

ing class levels" of business and industry.

In contrast to arbitrary retirement, where the individual worker is in a position to determine his own retirement procedure he usually chooses to taper off his activity over a period of years. This is possible for men in certain professions, such as physicians, farmers, the owners of small businesses, and workers in certain skilled trades.

The older physician or dentist may refuse to take new patients and so reduce his practice at his discretion. The lawyer may cut his load by reducing the number of his clients. The minister may give up the full-time ministry but keep as busy as he wishes by "supplying" small churches which lack regular pastors. A farmer may hire more help, or rent out a large part of his land. In certain crafts, the older members are permitted to reduce their hours of work.

Related to the preceding method of retirement is the mode of retirement in which the person slowly turns responsibility over to a successor. He does not dissociate himself from his occupation, but the work is shared with a younger person who will eventually take over full responsibility. For example, a farmer may gradually turn the running of his farm over to his son or son-in-law, an artisan may turn his work over to a younger associate, a business man may turn his business over to a son or a junior partner, a doctor or lawyer may take in a junior associate to assist in his practice.

In another type of retirement the individual remains in the same job situation, but "steps down" to a position which is lower in prestige or authority. For example, a dean in a university may retire from administrative duties but remain as a professor, a clergyman in a large parish may become an assistant to a new chief, and an assembly-line worker may become a floor sweeper. In certain industries this "down-grading" as it is called, is increasingly practiced.

Sometimes, after voluntary or compulsory retirement from a particular position, an individual may find a job at the same prestige level which is less demanding of his time and energy than his life-time occupation. To illustrate with some specific examples, a university president becomes a consultant to a broadcasting company, a high army officer retires and becomes a vice-president of a business corporation where his name and his general administrative experience will be useful, a university professor of education upon retirement becomes a school consultant and directs school surveys, and a Y. M. C. A. secretary becomes a part-time director of a small-city chamber of commerce.

Related to this mode of retirement is a type of activity which is not retirement at all but rather a change of occupation. This is illustrated by the occasional "retirement" of a man at 35 or 40 from "business" after he has "made his pile," and his entry into a less lucrative but more personally satisfying position in government service, university work, or public affairs. Another illustration of this sort of "retirement" is that of the man who "always wanted to do something else" and who leaves his job at 50 to take up a new kind of work. In addition, there are a number of occupations requiring physical vigor from which one retires early enough to permit one to start a new vocation, such as is the case with policemen, firemen, professional athletes, airline pilots, et cetera. This change of occupation, properly speaking, is not a type of retirement, although clearly it does mean an interesting and sometimes difficult problem of adjustment for the individual.

The usual types of retirement which are available in our society may be summarized as 1) arbitrary retirement at a fixed age, 2) the tapering-off of activity, 3) slowing down, turning over responsibility to a successor, 4) a lower level job in a hierarchy, and 5) a different and less demanding position in another work situation.

The Professional Worker

In 1948 about 7 per cent of all employed persons were classified as professional and semi-professional persons by the U. S. Bureau

of the Census. Professional and semi-professional persons, according to the Census, included actors, artists, musicians, librarians, nurses, chemists, architects, engineers, clergymen, lawyers, doctors, dentists, pharmacists, teachers, social and welfare workers, and veterinarians. The category of professional and semi-professional workers also included designers, surveyors, and dancers, showmen, and athletes.

Of the total group of employed professionals, 32.9 per cent were 45 years of age or more, and 4.2 per cent were 65 years of age and over. These percentages are close to the age distribution of the labor force as a whole in which 35 per cent of all workers are 45 years of age or more, and 4.7 per cent are 65 years of age and over.

While for the Census Bureau, athletes and physicians were both classified as members of the professions, the term "profession" or "professional worker" has a distinct meaning in our culture. We will not attempt in this paper to differentiate the professions from all other occupations, but we will point out those aspects of the professional career which come to play a major role in retirement (1, 5, 7).

When we speak of professionals we almost always think of the "learned professions." Indeed, one of the distinguishing marks of the professions, of the occupation of teacher, lawyer, doctor, engineer, clergyman, et cetera, are that they require specialized training. Bartlett (1) draws a line between these former professional groups and the Y. M. C. A. secretary, social worker, and librarian, because, in general, these latter occupational groups at the time of his study, were not trained *before* they took their positions. One mark of professional occupations then, is that they require intensive and special preparation. It may be mentioned that the word "professional" is used loosely in any field to describe someone who has better than average skill.

Another mark of the professional is that he occupies a desirable status or position in our society. Although professionals may be considered white-collar workers, the practitioner in the professions prefers to be identified as a professional rather than as a white-collar worker. Because professional implies desirable status, late-comers into the professional disciplines are extremely self-conscious about their degree of professionalization. In 1915, Flexner (3) published a paper on "Is Social Work a Profession?" At the present time social work is generally accepted as a profession, but there are many recent papers on nursing as a profession, occupational therapy as a profession, dietetics as a profession, et cetera.

In our middle class society the professional role is considered a desirable role. It is a role which carries more prestige than the role of the white-collar worker. The organizations of professionals, reflecting this, are not unions, but learned societies or associations. The professional worker secures satisfactions from his professional status which are often not forthcoming in either his work situation or in his financial compensation.

One of the distinctive characteristics of the professions for the individual is that the professional feels that he has a calling, *Beruf*. The professional person may and sometimes does describe himself as "dedicated." Whether this is a result of long training, professional associations, et cetera, need not concern us. We may report, however, that for many professional persons, "their work is their life." Over and over again in our materials there are comments such as these: "I always wanted to be a doctor, I can't imagine doing anything else." Or from a teacher: "I always wanted to teach, I love my work."

It is these characteristics of the professions: long training, desirable status, professional association, and the conception of his career as a calling, which make the adjustment problems of the professional worker in retirement different from the adjustment of other older workers. Since so much of the satisfaction of the professional comes from the status which he secures from his role and his professional associations, in his retirement he clings to this role and to these associations. On the other hand, the worker in industry may have other and

more general identifications than that with his particular occupation: as a worker, as a member of an ethnic group, or as a member of a given social class. He may already be among the "dispossessed" in terms of status so that retirement from the job situation may not represent any marked stepping-down in the status hierachy.

The professional worker has spent years in preparing himself for his specialty and he views his job as important, essential, and *individual*. The skilled worker in industry even though he may consider his job as essential usually does not consider it and his experiences in it as unique to him.

Important in the retirement of the professional is the feeling of deprivation which so many report when they are away from work. It is rare to find an industrial worker whose work has come to be as much a part of his life as medicine is for the doctor or the role of community leader is for the Y. M. C. A. secretary.

The professional worker and the non-professional worker both face the problem of economic support in retirement. Up to quite recently, however, this problem has bulked larger for the non-professional groups (2, 4). Now, with current inflationary trends, the economic aspects of retirement are becoming increasingly important to professional persons.

In general the problems of the professional worker in retirement are personal problems. How can he maintain his self-conception and his status, and how can he fill the void that comes with leaving, however willingly, a calling to which he has dedicated his life?

All of the usual types of retirement which have been mentioned above, arbitrary retirement, the tapering-off of activity, slowing-down, the taking on of a lower level job in a heirarchy, and the adaptation of a less demanding position in another work situation, are available to professional workers and all of them have been followed by some among the group of persons whom we have studied.

In general we may say that where the individual is offered a choice, as is the case with the physician, he chooses to taper off his activity and to slow down rather than to retire from work completely or to take on a lower level job in a hierarchy or a less demanding position in another work situation.

Summary

Retirement is a relatively new phenomenon in our culture. To understand the retirement experience, one must first consider the meanings assigned to work. These meanings of work have changed through time. For contemporary man work is a way of earning a living, a duty and a right, and less clearly and universally, a privilege.

A number of different kinds of retirement are available to professional persons. In general, where the individual is offered a choice, he prefers to slow down or to take a lower level job in another work situation rather than to retire from work completely. A detailed statement of the experiences of professional people in retirement will be made in a subsequent paper.

References

1. Bartlett, L. W.: *Compensation in the Professions.* Association Press, New York, 1933, p. xiii.
2. Clark, H. F.: *Life Earnings in Selected Occupations in the U. S.* Harper and Brothers, New York, 1937.
3. Flexner, A.: *Is Social Work a Profession?* (An address before the National Conference of Charities and Corrections). New York School of Philanthropy, New York, 1915.
4. Friedman, M., and Kuznets, S.: *Income from Independent Professional Practice.* National Bureau of Economic Research, New York, 1945.
5. Hughes, E. C.: Institutional Office and the Person. *Am. J. Sociol., 43:* 404-413, 1937.
6. Tilgher, A.: *Work: What It Has Meant to Man Through the Ages (Homo Faber)* (Translated from the Italian by Dorothy Canfield Fisher) Harcourt, Brace and Co., New York, 1930.
7. Wilson, L.: *The Academic Man.* Oxford University Press, London, 1942.

Submitted for publication February 28, 1952
The senior author's address is:
Dr. Robert J. Havighurst
University of Chicago
Committee on Human Development
Chicago 37, Illinois

A Community Plans a Recreation Program for the Aged

HELEN G. LAUE

PLANNING for any community service always begins when someone sees a need and a lack of services to meet the need. In Chicago, those who first saw the need of aged people for recreational activity were social workers in public and private family agencies who were dealing, in the main, with problems of housing, finance, or family relationships. They saw the loneliness and isolation of many older people whose usual occupations were no longer available to them, whose friends and relatives had died or moved away, or were too busy with other activities in which the older person was no longer needed. At about the same time, sociologists at the University of Chicago had taken a look at the significant increase of older people in the population and had been studying the problem of personal adjustment of older people.

Something else had to happen, however, before community planning began. The case workers reported their findings to a community wide planning body—in this case, the Welfare Council of Metropolitan Chicago. The facts were sufficiently arresting so that the Welfare Council sought funds to explore the problem further to see what could be done toward meeting these needs. The sociologists also sought funds for further study and services. The financing body told the sociologists and social workers to get together. In this case they did, and we had as a result, the four year study demonstration and planning project—The Community Project for the Aged—under the sponsorship of the Welfare Council of Metropolitan Chicago.

Planning for recreational and creative activities for the aged was only one part of this project, but it is important to note that in this case planning for recreation was an integral part in planning for all services and programs for elderly people in the community. Because the need for activity and companionship was so apparent, the first committee appointed by the project was a Recreation Committee. Membership of this committee cut across religious, racial and nationality groups. Professional workers were not limited to those in recreation agencies, but were drawn also from sociology, the professional arts and crafts, occupational therapy, institutional programs, religious bodies, the Public Library, the Art Institute and public and private family agencies. Later in its development the committee added professional workers from the educational field. Older people from the Borrowed Times Club and the Old Age Assistance Union were included in the Committee (1, p. 138).

The committee considered the word "recreation" to include those activities and those relationships with other people which give meaning and value to the leisure of the individual. The Recreation Committee started out with the premise that leisure-time activity of persons over 60, as of other adults, will be determined on the basis of interest. They were convinced, however, that some older adults had been so rejected by society in one way or another that they would need a more protected setting than the usual Art Institute or Park District activities, Great Books courses, or civic activity provided. The Committee knew from experience of its members that among the older people of Chicago there were:

> Those who had developed interests outside their work before retirement:
> Those who had developed no interests outside of their work.
> Those who had friends and continued to relate themselves effectively to other people;
> Those who had never developed ability to relate themselves effectively to other people or who had limited themselves to such a close circle that when this was broken they did not know how to make new friends;
> Those who because of physical disability, loss of family, friends, or money, or having to move into a new community, required opportunities for learning new skills, acquiring new friends and new interests.

The committee recognized also that some of these older people were able to get about without help, some were able to get about only with help, while some were home-bound and still others bedridden. Many were living alone, in a room or apartment, in residential hotels, in "flop" houses. Others still had husband or wife or lived with children or other relatives. Still others lived in congregate living arrangements. The needs of all these people for creative and recreational activities and for human relationships were made the concern of the Recreation Committee. The committee saw its jobs as sixfold:

1. Getting the facts about the older people in the Community and about the facilities, activities, and community resources available to them.
2. Disseminating information about the activities and

Presented at the Second International Gerontological Congress and Fourth Annual Scientific Meeting of the Gerontological Society, Inc., September 9-14, 1951, St. Louis, Missouri. Published on a grant from the Forest Park Foundation.

facilities that were available so that older people, their families, and friends might know of these possibilities.
3. Stimulating the imagination of older people, agencies, and "the average man" to the possibilities for the enrichment of life in later years.
4. Encouraging the development of new activities, facilities, and services for older people.
5. Providing for the training of professional and volunteer workers with elderly people and for the development of leadership among the older people themselves.
6. Securing the acceptance by the coordinating and planning agencies of the community of continuing responsibility for planning an adequate program of recreation for the aged.

These tasks could not be performed in one-two-three order but were interrelated.

The committee's fact-finding continued with a survey of recreation programs offered to older people by public and private agencies and by voluntary organizations formed by the older people themselves. The information gained was published as a "Fun after 60" guide to recreation for older people. Copies were used for reference purposes by 60 branch libraries, 90 park supervisors, by case workers in public and private agencies, by clubs, and by newspapers to give information to older people. Periodic revisions were made as more activities became available or as other groups became known. By-products of the survey were the interest that was aroused in the development of new programs and the desire of the professional workers for an opportunity to discuss their common problems.

The Recreation Committee, in response to this last request, conducted cooperatively with the Education and Recreation Division of the Welfare Council an institute for leaders of groups participated in by educators, case workers, group workers, artists, and occupational therapists. Still later the Recreation Committee cooperated with the University of Illinois to offer an institute on Group Work with the aged.

The committee also served as a consultant on a survey of recreation in homes for the aged conducted by a Research Seminar of the University of Chicago, School of Social Service Administration. The committee considered the needs of the aged in Chicago as they knew them in relation to the facilities and programs revealed by their survey. They found many gaps in the services. Most of the programs for older people were in settlements and community centers which clustered in a relatively small semi-circle around the center of the city. There were no special programs operating on a daily basis and existing groups often met only once a month and not at all in the summer (1, p. 143).

The uneven geographic distribution of the groups imposed further hardships, since many older adults could not afford carfare or did not have the energy to travel far. There were many neighborhoods in which the churches were the only possible meeting places, and, in 1947, not a single church had paid any special attention to the needs of the elderly.

The study did not try to evaluate the quality of programs, but observation indicated the need for more constructive and dynamic planning. Too often workers accepted the view that passive recreation was all that was possible. With the best of intentions, others "gave" programs to their older clients and never considered the potentials for leadership within the group. Some agencies said there was no need to expand programs, because nobody wanted them, not realizing that older individuals who feel isolated and rejected require special work to bring them into active participation (1, p. 143).

It was obvious that the abilities and potentialities of older people had to be dramatized in order to convince agency, board, and staff members that it was worth spending time and money to extend their services to this age group. Many methods were used to get this message across. One of the most effective was the annual "Fun After 60" Hobby Show. From its beginning in 1947, the Hobby Show was both an exhibit of arts and crafts which had been produced by older people and a demonstration of other activities, such as dance, music, and drama.

The Recreation Committee initiated the Hobby Show, but as early as the second year secured the cosponsorship of the Chicago Recreation Commission, Chicago Park District, the Catholic Charity Bureau, the Jewish Federation, the Lutheran Charities, and the Federation of Settlements. The Recreation Commission eventually assumed responsibility for central coordination and administration. The Hobby Shows provided opportunities for the use of other educational media, such as television and radio, newspaper stories and pictures. As a result of the Hobby Shows, the committee was able to introduce a section on older people's programs in "Chicago at Play," a well advertised exhibit and demonstration presented by the Chicago Recreation Commission to the general public.

Speakers at meetings of Community Councils, Adult Education Meetings, Union Conferences, and church gatherings presented the facts about older people as well as presenting the apparently novel idea that older people have recreational needs that can be met.

Agencies and organizations in sections of the city where the needs were greatest were approached to see if they would undertake this new program. At the end of the first year, recommendations made by the Committee resulted in some community fund allocations toward the salaries of part-time workers in Fund agencies. Other recommendations resulted in the Chicago Park District and the Recreation Commission accepting more responsibility. The Park District not only did more work with the Hobby Show but encouraged the inclusion of older people in more of the park activities formed on an interest basis. More

groups set up specifically for older people were also organized in parks. From 1947 to 1950 the number of park district programs increased from 20 to 39. During the same period, the number of groups in settlements and community centers increased from 25 to 43.

Two housing projects and two suburban agencies developed new programs, as did five churches, three libraries and two YMCA's. The total number of groups in the city increased from 54 to 104 in this three-year period. In 1947 there were no camping programs for the elderly; in 1950 five camps made special provision for older campers. On recommendation of the Committee, the Chicago Recreation Commission accepted responsibility for sponsoring an annual conference of older people aimed at helping them improve their programs and their leadership techniques.

During all this time, however, the only organization putting a sizeable amount of money and trained staff time into this work was the Jewish Community Centers, which had increased its staff from 1 to 4 professional workers. Its pilot program is a constant demonstration of what can be done with well qualified staff giving full attention to this program. One YMCA also has a full time professional staff member. All the other work was being done on a fraction of the time of a professional worker.

Meantime the needs of the home-bound older person had not been entirely neglected. The Recreation Committee and the Volunteer Bureau worked together to meet the recreational needs of the home-bound, first through a friendly visiting program and later a senior citizens' hobby center.

The friendly visiting program is an attempt to provide companionship for those who have become socially isolated and home-bound. This activity proved to be one of the most popular and appealing to the community at large. Employed men and women enrolled for training in the evening, and the visitors requested monthly meetings to continue their education (1, p. 157). Two training courses a year are held to keep an active group of approximately 125 friendly visitors at work.

Friendly visitors, when their training course is completed, are assigned to agencies, and by them assigned to visit older clients. The Agency assigns visitors only to older clients who have indicated a desire to have a visitor. Agencies using visitors include Family Agencies, the Department of Visitation of the Blind, the Home for Incurables, Homes for the Aged, Cook County Bureau of Public Welfare, and some community centers (1, p. 158).

In 1950 the United Lutheran Social Mission Society requested that some of their church volunteers be included in the course with the understanding that the agency would supervise the activities (1, p. 158). The Jewish Family and Community Service and the Catholic Charity Bureau developed their own Friendly Visitor programs.

The friendly visitors and agency workers continued to express concern about the need for significant activity for the older people who were withdrawn or home-bound. Since this was a relatively unexplored field it was difficult to find out what these older people would like to do, or how we could teach the volunteer visitors arts and crafts which they, in turn, could make available to those visited. At this point we were offered a flower fund of a few hundred dollars set up at the Chicago Community Trust by a young woman at the time of her mother's death. This was to be used to make life more pleasant for the infirm, lonely, older person (1, p. 159).

As a result, the volunteer planning committee decided to set up an experimental demonstration to see what could be done in teaching arts and crafts to the home-bound (1, p. 159). In this planning also the membership of the committee was important. It included representatives of those organizations dealing with home-bound people such as the Central Service for the Chronically Ill, the Illinois Association for the Crippled, Inc., caseworkers, occupational therapists, and representatives of nursing home operators.

The clinic, as it was called during its experimental period, operated for four months in the spring and summer of 1950 at the loop YWCA. Sessions were held once a week from 10:30 AM to 3:00 PM under the direction of a project staff member and a retired occupational therapist. To the clinic came friendly visitors and nursing home operators. The friendly visitors brought to the clinic a selected group of older men and women. Other older persons came by themselves, or with the assistance of a relative. The weekly sessions gave everyone a chance to try his hand at a variety of activities. Emphasis was on activities that the older person could afford and could carry on by himself at home. With the counselling provided by the project, every older individual showed definite progress back into community life. Some went on to share in the programs of other community agencies; others left, planning to put their new skills to use by making articles to sell. Nursing home operators and friendly visitors began to introduce what they had learned to the older persons who could not be brought to the clinic (1, p. 159).

The results of this experiment convinced the committee that this kind of program was needed on a permanent basis in Chicago. In February, 1950, therefore, the program reopened as the Senior Citizens Hobby Center. It is operated by a special advisory committee under the sponsorship of the Volunteer Bureau of the Welfare Council. Here again the membership of the committee was important. Since the objective was now to develop the Center into a

permanent community service, individuals from the community at large and representatives of such interested groups as the Federation of Women's Clubs were included in this new operating committee along with agency representatives.

The program was offered on a fee basis to see if it would attract a greater variety of individuals. Scholarships were provided for those who could not afford to pay. In every case the problem was to help the person find the particular form or forms of activity that seemed worth while to him and was commensurate with his ability. Under its new advisory committee a plan for service to nursing homes was developed.

Craft instructors are trained at the center by the occupational therapist. The Nursing Homes pay the Center a membership fee for setting up the program in the home and also pay for the services of the instructor and an additional charge for her supervision by the occupational therapist. The craft instructors are assigned to nursing homes and paid by the center. Other craft instructors who are volunteering their services to groups of older people in churches, settlements, and mental institutions are also attending the center as students. The Center is now seeking funds to enable it to expand into a more adequate full time program with staff members qualified in the fields of group work, community organization, and counselling.

One of the major and certainly the most troublesome problem of the Recreation Committee was that of finding a community planning agency to assume responsibility for continuing community planning for recreation programs. This was necessitated by the fact that the Community Project for the aged was not a continuing agency.

Faced with the fact that in Chicago there were as many persons 60 and over as there were children in the public schools, from kindergarten through high school, both the Chicago Recreation Commission, a public agency, and the Education and Recreation Division, a voluntary organization of the Council, accepted responsibilty for continuing planning in this field. In 1951, following the receipt of the recommendations of the Project in its community plan for older people in Metropolitan Chicago, these two planning bodies proposed a joint Committee on Recreation for the Aged with staff of both agencies assigned to work with the committee.

We are now assured that planning on a community-wide basis will continue. This new committee has some new facts to consider in the report of the project's study of needs of 552 older people known to the public and private family agencies in Chicago and in the reports of the staff members working with the many varied types of groups. It has the request of the older people themselves as a result of their conferences for a continuing planning committee of its own. It also has a new statement of its functions in the recommendations of the Community Plan. As the joint committee begins to work on these recommendations, we know the plan will continue to change and grow. I have tried to indicate by this description of our planning in Chicago the dynamic nature of planning.

Summary

Community planning requires a planning group widely representative of agencies, organizations, and individuals concerned with the development of a recreation program for the aged and those with knowledge in the fields of group work, recreation, and education. The make-up of the committee must be responsive to changes in the situation in the community. The Committee will also want to relate itself to other planning bodies in the community—both those concerned with recreation for all ages and those concerned with other problems of the aged.

The various aspects of the planning process are outlined.

Reference

1. *Community Services for Older People—The Chicago Plan,* prepared by the Committee for the Aged of the Welfare Council of Metropolitan Chicago, Wilcox & Follett Company, Chicago, 1952.

Submitted for publication October 11, 1951

The author's address is:

Mrs. J. Charles Laue

Welfare Council of Metropolitan Chicago

123 West Madison Street

Chicago 2, Illinois

Geriatric Nursing Programs in Schools of Nursing

BEVERLY C. ANDRÉ

In order to serve modern society effectively, the professional nursing curriculum must be dynamic in its technologic content. There is an awareness among nursing educators that the aged patient population in general and special hospitals has increased in the past ten years. As the nursing care for the aged patient differs from that of other age groups, the introduction of geriatric nursing into the curriculum has been recommended. Whereas education, social service, dietotherapy, medicine, and public health were studying various problems concerned with aging and the aged, nursing was considering a certain aspect of care related to the prevention of illness, the treatment of disease, and the promotion of health among senile individuals.

Purpose and Plan of Investigation.—The purpose of this study (1) was to investigate the content of geriatric nursing courses in a selected group of nursing schools so as to: 1) compare the variation in course content in these schools; 2) consider the basic likenesses in the geriatric nursing courses; 3) determine the extent of inclusion of clinical instruction in the nursing program; and 4) analyze recommendations made by nursing educators of the contacted schools.

Preparation of the Questionnaire.—In preparation of the questionnaire, certain aspects of the fields of medicine, dietotherapy, public health, vital statistics, and population trends were considered as having a definite relation to the problem. Literature in the fields of medicine, nursing, and social science, wherein problems of the aged were presented, served as a basis for the selection of the questionnaire items. Nine of the items in the questionnaire were concerned with the subject matter that might be included in a course or courses wherein geriatric nursing could be appropriately taught.

The normative survey method with the use of a questionnaire was selected to contact 160 schools that were recommended by various national nursing organizations for accreditation by the National Nursing Accrediting Service—1949 (3). Of that number, 126, or 79 per cent, responded. However, only the reports by 123 schools, or 77 per cent, were included in the investigation. The selected schools represented 71 hospital schools of nursing, 33 basic professional collegiate programs, 23 programs in public health nursing for graduate nurses, and 11 postgraduate programs in nursing education. Twenty-five states, 2 territories, and the District of Columbia comprised the geographic distribution. Of the 34 schools that did not respond, 20 were hospital schools of nursing, 6 were basic professional collegiate programs, 5 were public health programs, and 3 were postgraduate programs in nursing education.

Analysis of Responses to the Questionnaire.—In the analysis of the material submitted by the contacted schools of nursing, Greenfield's dissertation, "Geriatrics in the Curriculum of Nursing Schools," (2) and the publication by the Subcommittee on School Data Analysis, "Nursing Schools at the Mid-Century," (4) served as the principle guides for evaluation of the qualitative factors within the various programs.

The reports received showed that there was considerable agreement among the nurse educators that the following theoretic items were suitable in any course or courses that included geriatric nursing.

1. A consideration of the problem of aging and the aged.
2. The social economic factors affecting the senescent and senile individual.
3. The emotional, mental, and physical aspects of late maturity.
4. The emotional, mental, and physical aspects of the senescent period.
5. The emotional, mental, and physical aspects of senility.
6. The nutritional needs of the geriatric patient.
7. The more common diseases among the aged, including particularly cancer, diabetes mellitus, cardiovascular diseases, arteriosclerosis, hypertension, arthritis, and accidents common to the aged.

Of the participating schools, 43, or approximately 35 per cent, indicated that the following items were not included: 1) the historical background of the problem including the recognition of the organizations that have been concerned with the care of the aged; and 2) medical research that has extended life expectancy.

Among the 71 hospital schools of nursing (table 1), 35 chose medical nursing as the single subject in which to include geriatric nursing, while 7 of these schools offered an independent course and 29 chose the multiple course approach to the material. Of the 33 collegiate basic schools of nursing (table 1) 9 selected medical nursing as the course in which to present geriatric nursing, while 2 had an independent course in the subject and 22 used the multiple course approach. (table 1). The report from the 23 public health nursing programs for graduate nurses (table 2) showed that 13 chose the introductory public health nursing course as a means of presenting geriatric nursing. One of the public health nursing programs offered an independent course and 10 selected the mul-

TABLE 1. PARALLEL DESCRIPTION OF THE BASIC PROFESSIONAL NURSING PROGRAMS IN HOSPITAL AND COLLEGIATE SCHOOLS.

Descriptive data.	SINGLE COURSE APPROACH				MULTIPLE COURSE APPROACH							
	Geriatric nursing included in medical nursing.		Independent course in geriatric nursing.		Geriatric nursing included in two or more clinical nursing subjects.		Geriatric nursing included in two or more clinical nursing and social science subjects.		Geriatric nursing included in all clinical nursing subjects. [e]		Geriatric nursing included in all clinical nursing and social science subjects.	
	Hospital school of nursing.	Collegiate school of nursing.	Hospital school of nursing.	Collegiate school of nursing.	Hospital school of nursing.	Collegiate school of nursing.	Hospital school of nursing.	Collegiate school of nursing.	Hospital school of nursing.	Collegiate school of nursing.	Hospital school of nursing.	Collegiate school of nursing.
Theory												
Number of schools.	35	9	7	2	13	12	11	1	2	9	3	0
Average number of theoretical items considered.	7	8.5	8.7	9	9	8.6	7.5	9	9	8.8	8	0
Number of integrated programs.	15	7	0	0	7	6	7	1	2	7	3	0
Number of extended programs.	15	1	0	0	5	4	3	0	0	2	0	0
Number of integrated extended programs.	5	1	0	0	1	2	1	0	0	0	0	0
Clinical Experience												
Number of programs with clinical experience and instruction.	27	6	5	2	12	12	6	1	2	8	2	0
Number of programs with definite time assignment for clinical experience.	5	0	3	1	3	2	0	0	0	1	0	0
Integrated experience programs.	22	6	2	1	9	10	6	1	2	7	2	0

TABLE 2. PARALLEL DESCRIPTION OF THE COLLEGIATE PUBLIC HEALTH NURSING PROGRAMS FOR GRADUATE NURSES AND THE COLLEGIATE POSTGRADUATE PROGRAMS IN NURSING EDUCATION.

	SINGLE COURSE APPROACH				MULTIPLE COURSE APPROACH		
Descriptive data.	Geriatric nursing included in medical nursing, ward management or clinical teaching.	Geriatric nursing included in preventive medicine, functional public health nursing course, advanced principles in public health nursing, or adult health problems course.	Independent course in geriatric nursing.		Geriatric nursing included in two or more clinical nursing subjects.	Geriatric nursing included in two or more public health clinical nursing subjects.	Master's program in public health nursing.
	Postgraduate nursing program.	Public health nursing program.	Postgraduate nursing program.	Public health nursing program.	Postgraduate nursing program.	Public health nursing program.	Public health nursing program.
Theory							
Number of schools.	6	13	1	1	4	9	1
Average number of theoretical items considered.	8.2	8.3	9	9	6.2	7.2	9
Number of integrated programs.	1	1	0	0	4	6	1
Number of extended programs.	5	12	0	0	0	3	0
Number of integrated extended programs.	0	0	0	0	0	0	0
Clinical Experience							
Number of programs with clinical experience and instruction.	2	4	1	0	1	3	1
Number of programs with definite time assignment for clinical experience.	0	0	0	0	0	0	0
Integrated experience programs.	2	4	1	0	1	3	1

tiple course approach. Six of the 11 postgraduate programs in nursing education (table 2) used the single course as a means of introducing geriatric nursing into the curriculum (medical nursing in 5 out of 6 cases). The independent course in geriatric nursing was offered by 1 of the 11 postgraduate schools while 4 chose the multiple course approach.

The reports from all 4 classifications reveal that clinical experience and instruction were not as completely established in the curriculum as the theoretic phase of the subject. Seventy-five per cent of the hospital schools of nursing, 76 per cent of the collegiate basic professional programs, 31 per cent of the public health programs for graduate nurses, and 34 per cent of the postgraduate programs in nursing education that offered geriatric nursing theory had clinical experience and instruction in the subject. The integrated method was most consistently chosen in both the theoretic and clinical experience areas by the 4 classifications.

This study indicated that geriatric nursing was most frequently introduced into the curriculum in medical nursing, or a similar public health nursing course, and that further expansion of the subject was accomplished through integrating the material in other appropriate clinical nursing subjects. Clinical experience and ward instruction in geriatric nursing were not included in 76 per cent of the 123 selected schools.

Recommendations.—The evidence given by the selected schools, the nature of the subject, and the belief among nursing educators that a certain element of individuality should exist within each nursing school suggest certain recommendations for a geriatric nursing program.

It is recommended that the basic geriatric nursing material be taught in medical nursing or the basic public health nursing course. The medical aspects of geriatrics could be included in the course in medicine. This latter recommendation would probably hold true only in the 2 basic professional programs.

It is suggested that wherever clinical facilities and faculty preparation permit the geriatric nursing program be extended into other suitable clinical nursing areas so as to teach preventive and rehabilitative concepts (5), to demonstrate individual differences that arise because of the age factor, and to present the patient-centered ideology in all nursing care.

It is further recommended that clinical instruction in geriatric nursing be an integral part of each clinical experience area wherein application is appropriate.

In the social science courses, the student should be given a fundamental notion of man's true nature so as to develop an understanding of the continuity of one part of man's life with another.

Finally, it is suggested that the faculty be given an opportunity to study geriatric nursing through university and college courses, intrainstitutional education programs, institutes, and workshops.

Research studies are needed to determine a definite time assignment in the theoretic and clinical experience areas of geriatric nursing in order to establish clearer concepts of the most adequate clinical nursing areas in which to include geriatric nursing, to postulate positive programs in preventive and rehabilitative geriatric nursing care, and to establish more complete clinical experience and instruction programs. Studies concerned with student practical nurse education and experience in geriatric nursing will be dependent upon the research findings of the studies of the professional nurse education in this field. Continued experiment with the team assignment within the individual hospital or social agency training or hiring practical nurses is essential.

Summary

An understanding of the nature of aging and the aged, together with certain fundamental principles that should guide the nurse in caring for an older individual, would seem to be the present goal in geriatric nursing courses. In making geriatric nursing an integral part of other nursing courses, the tendency to segregate the aged is eliminated, thereby fostering a continuity among all adult age levels.

References

1. André, B. C.: *Geriatric Nursing Programs in Schools of Nursing.* Unpublished thesis for M.A. degree, Immaculate Heart College, Los Angeles, 1951.
2. Greenfield, L.: *Geriatrics in the Curriculum of of Nursing Schools.* Unpublished thesis for M.A. degree, University of Chicago, Chicago, 1944.
3. Petry, L.: We Hail an Important "First." *Am. J. Nursing, 49:* 630, 1949.
4. Subcommittee on School Data Analysis: *Nursing Schools at the Mid-Century.* National Committee for Improvement of Nursing Services, New York, 1950.
5. Thewlis, M. W.: *The Care of the Aged.* C. V. Mosby Company, St. Louis, 1946.

Submitted for publication August 28, 1951

The author's address is:

Miss Beverly C. André, R. N.

Department of Nursing

Northwestern State College

Natchitoches, Louisiana

Report of the Fifth Annual Scientific Meeting of the Gerontological Society, Inc.

IRVING LADIMER

Scientific and technical sessions of the fifth meeting of the Gerontological Society, some held jointly with the Division on Maturity and Old Age of the American Psychological Association, September 5-7, in Washington, D. C., attracted over 400 delegates and participants. The program may be divided topically into biologic and medical aspects of aging; psychologic processes; health services; economic issues; welfare and education; and recommendations for research.

This report follows the form of the Final Report of the International Congress (Journal of Gerontology, April 1952, Vol. 7, No. 2) in that the material is topically organized. Abstracts of papers for this meeting were published in the program and in the Journal (July, 1952, Vol. 7, No. 3) and in the American Psychologist (July, 1952, Vol. 7, No. 7). Reference may be made to these summaries, listed by author, corresponding to the names parenthetically cited in the body of this report. Asterisks signify that no abstract appeared in the program.

I. POPULATION TRENDS AND CONCEPTS OF AGING

Basic to problems of aging is the simple statistical fact that as a nation we are growing older. The general population increase is matched by a more than proportionate increase in the senior segment.

Demographic Aspects

In 1900 between 4 and 5 per cent of our population was age 65 and over; today the estimated 13 million persons in this age group constitute 8.5 per cent. By 1960 there will be another 4 million Americans over 65 years of age and, in another generation, perhaps 10 per cent of our population will be considered old by chronologic measure. This continuing trend is largely the result of improvements in mortality and the recent rise in birth rates associated with World War II. Immigration, which tended to keep the population relatively young, has slackened considerably (Sheldon).

An historical approach considered differences in mortality rates of selected age groups in different eras. The outstanding effect of medical science in the past fifty years has been the tremendous increase in life expectancy. Until recently, major potentials for increase in longevity have applied mostly to individuals in the first fifty years of life; today the situation, although still favoring younger groups, is measurably apparent for older individuals (Lewis).

The validity of census data was raised. Totals and trends are no better than the basic information from which derived. It is known that many reports and census interviews, and consequently statistics on birth, death, and age, are incomplete and inaccurate because of inability or unwillingness to disclose proper age (Williamson).

Life Cycle and Aging

Concepts: A theoretic view of the aging syndrome presented aging as a manifestation of intrinsic and extrinsic environmental factors and stresses on physiologic and organic units. Under this theory, so-called normal aging is in reality an expression of a series of underlying chronic and acute degenerative processes, rejecting the popular notion that aging phenomena are normal. The ultimate aim of gerontology is to restore and maintain the organism at its full peak of youthful, structural, and functional vigor by minimizing environmental stresses which cause chronic degenerative disease (Perlman).

Another theoretic interpretation of the human life cycle criticized the current unwarranted emphasis on the importance of youth, sexual fertility, and physical ability. This emphasis leaves little place in a mobile and aggressive society for individuals in the "post-reproductive" period of life. It is postulated that it may well be the function of older members of our society to preserve culture, maintain the annals of history, and generally preserve the judgments, skills, instruments, and characteristics of our civilization (Linden and Courtney).

Life Span: In considering the life span of man, it was noted that death from disease effectively precludes a determination of the number of years that man can possibly live. Few if any deaths can be attributed to old age itself. The true longevity of man on a mass scale should be studied. The west north central states, which comprise the region of greatest longevity in the United States, provide the best opportunities for studying the upper limits of life (Ginzberg and Olsvary).

Research on a one-celled organism, Tokophrya infusionum, indicates that both length of life and reproductive ability improved when individuals were underfed and intermittently starved. Overfeeding

From the National Institutes of Health, Public Health Service. This report is based in part on press summaries prepared by the following staff members of the Public Health Service: Theodor Schuchat, Annabel Wehrwein, Mel White, and Evelyn Van Steenberg. Acknowledgment is made to Annabel Wehrwein for her assistance in the organization and preparation of the report.

lowered reproduction rates and shortened life spans drastically. Populations of these organisms kept on long periods of hunger with periodic introductions of food were able to survive and reproduce for longer periods, creating vigorous and thriving cultures (Rudzinska).

Age-Disease Relations: Two reports comparing course of disease in rats and in humans noted that diseases of rats may be chronic in nature and in many instances were similar to human diseases. The relationship between the development of such disability and of chronologic aging presents somewhat the same problem in rats as in man (Berg, Lester, and Simms). On the other hand, these studies indicated that age itself is apparently a larger factor in death than the accumulation of pathologic conditions throughout life (Simms, Berg, and Lester).

Creativity: Ability to succeed in creative fields varies with age. For most creative work, it may be generalized that an individual's maximum production for highest quality output usually occurs earlier than output of less distinguished work; that rate of good production usually does not change much in middle years. The decline, when it comes, is gradual at all the older ages. Production of highest quality tends to fall off not only at an earlier age but also at a more rapid rate than does output of lesser merit. The creative peak for the majority of great men analyzed occurs, in physical and biologic science and in the arts, before age 40, sometimes even in the 20's. Modal ages for successful athletes parallel averages of those who have achieved intellectual greatness. Positions of administrative academic supremacy, such as college president, of political leadership, and in industrial and commercial endeavor, are usually attained in the later years (Lehman).

II. BIOLOGY AND MEDICINE

Age-Disease Relationships

Discussion in this area emphasized the close relationship between the chronic diseases and the aging process. Studies of admission data on almost 17,000 patients to a General Medical Service indicated that coronary thrombosis, diabetes, obesity, and hypertension occur in combined diagnoses more frequently than can be expected by chance. This, however, does not appear to be true of rheumatoid arthritis and asthma. A comparison of age profiles of hospitalized patients with those of the general population demonstrated a consistent decrease in resistance to disease during adult life (Davies). The prevalence of diabetes mellitus increases with age, and among the older population the rate may exceed 6 per cent. Diabetics who were diagnosed at the younger ages are now living out their full life span, and incidence among persons over 45 is recognized to be higher than among the younger age groups (Krag).

Studies on the relationship of disease and age in animals showed that older guinea pigs have more spontaneous cancers than young animals and it is easier to induce the disease in the old animals. Young animals were generally not found to have tumors of the breast or skin nor were they usually susceptible to stomach tumors or ovarian cysts (Rogers). Alterations in the blood serum pattern of dogs with malignant tumors display characteristics similar to those in humans with the same diagnosis. Increased amounts of globulin are found in both dogs and humans in the presence of a neoplasm (Parfentjev and Whitney).

Physiologic Aspects

Structural Changes: Continuing research on the various components of the body in different age groups reveals a number of structural changes with aging. There is a striking increase of body fat during the period of maturity, the values in men ranging from about 10 per cent at age 20 to 25 per cent at age 55. Men of standard weight, by height and age, differ markedly in their fat content, statistically a "normal" feature of aging (Brožek and Keys).

Changes in bone structure were observed in the hand by radiographic methods. Growth of bone in the hand may be determined up to the seventh decade, after which there is a progressive decrease in minerals of the bone, indicating progressive aging (Bohatirchuk).

Age changes in cellular structure were noted in the difference in the patterns of mitochondria. These small rod-shaped structures are evenly dispersed in younger organs, but in older ones, the arrangement is disrupted, giving an appearance of loss of intralobular polarity (Andrew and Kurtz).

Observations on the cardiovascular system indicate that, in terms of the elastic behavior of living tissues and the interrelationships of vessel dimension, there is yet no basis for the explanation that the walls of muscular arteries "stiffen" with age. Estimates of pulse wave velocity, made by means of an electronic tapping device, showed an increase in velocity with age only within a limited pressure range. Major changes in the relation between velocity and pressure occur in individuals under 40 (Landowne).

In studies of refrigerated tissues of human aorta treated with hydrochloric acid and sodium hydroxide, it was noted that the albuminoid fractions combined with equal amounts of sodium hydroxide, regardless of differences of age or pathologic condition, but that the albuminoids from arteriosclerotic and aged aortae combine with larger quantities of hydrochloric acid than do those from relatively normal or younger organs (Miller and Kraemer). Other investigations on the tissue of the aorta showed an increase in the albuminoid portion containing collagenous, reticular

and elastic fibers with age (Kraemer and Miller).

Studies on the serum lipid pattern in persons over 65 showed that women as a group had higher serum lipid values than the men in all except the neutral fats. The ratio of total cholesterol to lipid phosphorus was equal in both men and women (Gertler and Oppenheimer). Cholesterol levels were not affected and there was a marked decline in the number of very small fatty particles following a diet of moderately large doses of lipotropic substances in persons with atherosclerosis, compared with apparently healthy individuals over the age of 50 (Labecki).

Functional Changes: Research to determine possible changes in psychosensory restitution of the pupillary response to light indicates significant differences between young and old subjects. Response of the fatigued pupil to psychosensory stimulation changed markedly with increasing age. Variation between the oldest and middle-aged groups was greater than between middle-aged and youngest, indicating that modification in sensory restitution becomes more apparent in later life, about age 70 (Kumnick and Misiak). Visual function seems to decrease with age at about the same rate as other sensory and motor functions. The functional relationship between foveal Critical Flicker Frequency and age was found to be linear and negative (Coppinger).

Nervous system function changes were observed by comparing the results of tests of simultaneous tactile stimulation in institutionalized adults aged 40 to 96 and children aged 3 to 6. Types and persistency of perceptual errors of older normals varies with age; patterns of error for those over 65 resemble those of children. Such perception is most "faulty" at the beginning and end of the life span, paralleling other measured functions of the nervous system (Bender and Green).

In the area of brain activity, electroencephalogram recordings indicate a greater incidence of slow waves among older people. Greater changes were found, including a higher percentage of abnormal encephalograms, in normal males from 80 to 94 than in those from 65 to 80. Although slow waves predominated, fast rhythms were frequent with resultant irregular brain wave patterns (Obrist). Other evidence that nervous system function decreases with age is found in measurements taken at the wrist, elbow, and axilla of 175 males. Conduction velocity of motor fibers of the left ulnar nerves decreased with age, beginning as early as the fourth decade (Norris, Shock, and Wagman).

Electrocardiographic studies of normal young and middle-aged men indicated a greater degree of oxygen deficit in the inner layers of the heart among the older men following moderate exercise. Thus, differences in electrocardiographic response to exercise is related to the known decrease of physical fitness with age (Simonson).

Metabolic changes are apparent with increasing age. Over the age of 40 there is a gradual reduction in the amount of oxygen required under conditions of rest. These values vary, however, even in the older age groups. Reduction in basal metabolism is ascribed to a reduced uptake of oxygen in the lungs of older people rather than to any changes in the amount of air breathed in (Shock and Yiengst). Increased cerebral blood flow and decreased cerebral vascular resistance were noted in elderly patients with cerebral arteriosclerosis with or without hypertensive vascular disease. The changes were not as marked as those observed in younger patients without cerebral vascular disease. Oxygen utilization in the brain did not increase with increased CO_2 inhalation, suggesting that the administration of cerebral vasodilating agents to such patients to improve oxygen supply would appear to be unwarranted (Fazekas and Bessman).

Further reflections of alterations in the body's functioning are seen in the fact the rate of blood perfusion through the tissues declines with age, with the greatest decrease generally occurring between age 18 and 25. At 18 the average rate of perfusion is about 25 ml. of blood per liter of tissue per minute, gradually falling off until it reaches about 10 ml. in middle age, approaching 5 ml. in the 60 to 70 age span, which is not much above the point at which gangrene can develop (Jones).

Animal studies on functional changes within the body reveal that the rate of oxygen uptake of thymus suspensions of rats decreased as body size increased and was less well maintained in larger animals. With respect to size and condition of thymus, respiratory activity varied with its state of involution. In cases of adrenalectomy which approximately doubled the thymus weight, there was no effect on the respiration in larger sized animals (Birmingham and Desbarats).

Tests on young, middle-aged, and old rats to determine changes in adrenal cortical functions by the administration of cortisone, epinephrine, and ACTH indicated that there were no statistical age differences in responses to the first two substances. Young and old rats had a greater fall in the circulating eosinophils after administration of ACTH than did middle-aged rats. With respect to age differences in output under unstimulated conditions, old rats put out less cortisone-like substances than middle-aged rats, which in turn released more than young rats. Older rats evidently have a greater sensitivity to larger doses of cortisone, as evidenced by the fact that a larger number of old rats treated with cortisone died earlier upon cessation of therapy than middle-aged or younger ones (Grad, Sher, and Symchowicz).

III. PSYCHOLOGY

Psychologic Processes

The accepted concept that intellect begins a gradual decline commencing in early maturity was challenged. Studies of over 1,000 prison inmates showed that general intelligence reaches a peak and remains fairly constant until the end of life or the onset of senility. Comparing the prison group with findings reported by Wechsler, it was noted that for both groups performance ratings drop off, but with respect to verbal abilities the combined trend for the prison data is to rise from age 15 to 55 and to fall from that point on; Wechsler's verbal average holds fairly well to about the age of 40 and then it falls. Wechsler notes little difference in the amount of general cultural knowledge of persons 15 and 55, while the prison data show that 55 year old people seem to have more cultural knowledge. Tests of speed, vision, and hearing should not be given weight in testing intelligence of older subjects (Corsini and Fassett).

On the other hand, it was found that elderly subjects are almost invariably slower and less accurate than younger people in simple tests of adding columns of figures. Loss of speed is intimately involved in aging of the nervous system; thus elimination of the time element from psychometric indices would seem to neglect important psychologic and psychophysiologic data. However, reductions in physical and physiologic capacity may be merely a reflection of lack of interest and stimulation (Birren, Allen, and Landau).

Correlations of Rorschach findings with physiologic changes due to aging in terms of the functioning of the vascular system, excretory system, and the central nervous system showed no significant relationships in either the vascular of excretory systems. However a significantly greater number of generalized abnormal electroencephalographic recordings was found in subjects with low perceptual clarity. Patients with EEG records evincing focal disturbances showed no differences in perceptual clarity (Frost, Thaler, Busse, and Shy).

Two studies of the relationship of aging to performance and attitudes of airplane pilots indicate that not only do physical and sensory capacities seem to be adversely affected, but motivation for learning and applying new skills and even relations with co-workers decline with age. Ineffective behavior seems to be a direct result of increasing susceptibility to fatigue (Miles). On the other hand, no statistically significant relationship between age and accidents was demonstrated. Age is a factor when complicated tasks must be performed against a limited time, but ability of the pilot to perform efficiently depends less on specific psychophysiologic change than is generally supposed (McFarland).

Personality Changes

The effect of conscious and unconscious influences, attitudes and behavior, and life history on the later years was considered. In a group of hospitalized patients and a group of outpatients over 60 years of age it was found that there is a definite shift of religious activity with less participation in church and church functions, although no change in religious belief. Interest in sex remained. Among aged women more than men sexual frustration is a very important anxiety-producing factor. Attitudes toward grown children were largely unconsciously determined, representing the end product of lifelong experience influenced by dependency-hostility conflicts (Busse, Barnes, and Silverman). A pronounced difference in attitude toward health, recreation, home and family, self-confidence, emotional adjustment, interpersonal relations, and standards of conduct was noted between young and old normal individuals as measured by a psychosomatic inventory (Brožek and Keys).

Certain factors in a patient's life history (education, occupation, and the extent of indulgence in alcohol) representing poor personality integration seem to be related to the development of psychosis with cerebral arteriosclerosis, as found among patients in a mental hospital. Few highly educated individuals and a preponderance of those with little education, few professional and white-collar persons and more labors and draftsmen have this psychosis (Epstein and Naiman).

Adjustment to Aging

The older person in the general population seems to be able to adjust to his advancing years, as indicated by a number of studies. Among a group of persons of varying social and economic status, considered by their peers to be well-adjusted, continued participation in the community, good health, and preretirement behavior patterns were factors contributing to enjoyment of later life and adapting to retirement (McNulty). A group of alumni of a State college attributed enjoyment of retirement to hard, happy, and continuous work throughout adult life and favored flexible retirement in accordance with physical conditions (Britton). Similar findings were noted in an institutionalized population, indicating that a happy old age could reasonably be achieved if the individual had generally engaged in hard work over long hours of time and had rather limited social activity and a religion-oriented life (Blake).

In contrast, institutionalized persons in county homes in the midwest were reported to be forlorn and hopeless, living in an inner and outward atmosphere of depression, loneliness, resignation, and social isolation, looking backward rather than forward (Olsvary). However, institutionalization seems to have some good effects, for contrary to prevailing

opinion it was found that men and women living in institutions have fewer complaints about physical and mental illness than those living in their own homes. Men complain less than women, perhaps due to the fact that they accept institutional care more readily. Although there is an increased susceptibility to disease among the aged, the decrease in complaints may result from a higher threshold of pain, difficulty in reporting symptoms, or acceptance of poor health as a concomitant of aging (Tuckman, Lorge, Steinhardt, and Zeman).

Improvement in adjustment of institutionalized persons was noted after participation in activity programs, while lack of opportunity for participation resulted in an increased tendency toward withdrawal and self-isolation (Donahue, Hunter, and Coons).

For older persons in the general population, activity programs tend to be of a sedentary nature, with organized recreation of relative unimportance. Reading, working in and around the house and garden, and listening to the radio take up most of the leisure time of the studied group, with hobbies of minor importance (Webber).

Discussions of methods of testing the quality of adjustment to old age pointed out that while the Rorschach test may be used as a valid measure of the integrity of the personality structure, it is not a sensitive index of the individual's behavior in a social situation (Wenar). The Cornell Medical Index, in conjunction with a supplementary health questionnaire, were found to be valid tools for approximating the health status of large groups of old people, although there is need for revising both questionnaires to reflect better the particular health problems of the aged (Steinhardt, Zeman, Tuckman, and Lorge).

IV. HEALTH SERVICES

Problems of chronic illness associated with aging and characteristic needs of older people for medical attention require special and different treatment on the part of physicians and institutions.

Medical Practices

Cardiovascular Disease: Diagnosis and treatment of heart disease in institutionalized aged men and women at one center have concentrated on clinical and pathologic characteristics of coronary conditions in aged individuals in order to differentiate them from similar manifestations among young individuals. Difficulties of proper diagnosis and the high incidence of complications distinguish the older groups. There is, however, a remarkable ability of the injured myocardium to recover from serious injury (Gerber, Storch, and Zeman). At the same Home, work is proceeding on the use of various drugs in the treatment of older patients with cardiac arrhythmia (Storch and Tang).

With respect to mental patients, the use of metrazol for arteriosclerotic cases was found quite effective. Mental state of psychotics improves, appetites become better, there is less fatigue and a general advancement in physical and mental behavior. At this stage there has not been opportunity to determine what metabolic or other changes are made by use of metrazol (Katzenelbogen and Fong).

Liver Function: Another study of diseases affecting institutionalized aged persons indicated that generally there is no clinical evidence of disturbed liver function among older people, but liver function tests demonstrated various deviations from normal, with greater incidence of increased sedimentation. These modifications may be related to nutritional deficiency or gastro-intestinal changes in digestion and absorption (Sorter). Poor nutrition in older persons was pointed to as a primary cause of liver damage, a matter of considerable importance in geriatric patients. Dietary habits of older people change from consumption of proteins to more carbohydrates in the form of sweets and starches, resulting in protein deficiency. Nutrition therapy directed at the liver to remove abnormal fat deposits may be indicated (Pomeranze, Migden, and Dubovsky).

Surgery: Surgical aspects were considered in the management of gangrene which may result from peripheral vascular disease, arteriosclerosis, or diabetes among older people. In a study of midthigh amputations made among bad-risk patients, almost all of whom were in the older age groups, surgical complications reportedly arose because of delay and poor timing of the operation frequently due to overconservatism and dependence on antibiotics and toe operations. In those patients without obvious ascending infection or marked thrombosis, results are generally good if the amputation stump is not left open but is followed by tight or loose closure. Anesthesia by freezing, with tourniquet, and similar procedures are contraindicated because they may lead to excessive trauma, thrombosis, and stump breakdown (Carp).

More attention must be given to preoperative preparation for surgery on older persons, particularly for cancer and other diseases of later life. Blood volume estimated on over 1,800 patients in a general surgical service, including 40 per cent over age 60 and 17 per cent over 70, demonstrated that decrease in blood volume was not so much due to advanced age as to decreased physical activity and to any disease if present (Walker).

Medical Care

Individual differences in capacity, interest, and needs on the part of older people call fo improved and specialized institutional supervision and noninsti-

tutional care, such as home and community service.

Institutional Arrangements: One hundred hospitalized assistance clients of a county welfare agency were studied to find out whether it was possible to predict which older persons are likely to need hospital care. Although average age of the patients was about 75, about one-third were able to live alone both before and after hospitalization, another one-third required treatment for heart and related diseases, and the balance needed care for a variety of other ailments (Yanacek).

Many elderly people are hurriedly placed in mental wards or hospitals when their conditions are due to nutritional deficiencies, overmedication, alcoholic intoxication, or emotional hysteria. Care provided under such circumstances is generally inappropriate. Only 20 per cent of cases sent to a State mental institution were found truly psychotic after 3-day observations in a detention unit. Proper evaluation, classification, rehabilitation, and placement of the chronically ill, infirm, and the aged can prevent further mental and physical deterioration and aid in relieving overcrowding of mental institutions (Tutles).

In recognition of the increase in emotional illness accompanying the lengthening life span, consideration is being given to providing psychiatric treatment to older people that may prove beneficial within a relatively short time. Since for old people, psychiatric work is limited by the short span of years remaining and paucity of physical and mental resources, methods for conserving psychiatric facilities without denying reasonable care are needed. An experimental program of brief, spaced, short-term psychotherapy in a home for the aged has met with some success. It is premised on the belief that loss of resources among the aged arouses feelings of helplessness, setting up patterns of dependency upon a parental figure—a role which could be adopted by the psychiatrist. Only seven and one-half hours of psychotherapy given over a 2-year period were able to change behavior so that patients could remain at the home when transfer to a mental hospital had seemed the only solution (Goldfarb).

Rehabilitation training for institutionalized persons was also recommended. Hospitalized patients in their seventh and eighth decades suffering from several psychoses were found to benefit from such treatment. They were able to return to their own homes and achieve minimum self care with some family supervision. Psychosis is an obstacle, but not insurmountable (Lakritz and Fensterheim).

Extra-institutional Care: Experience in rehabilitation work emphasizes that in treating the aged there has been little or no coordinated research in the psychosocio-economic aspects of chronic disability and the aging processes. Comprehensive geriatric diagnostic and evaluation service are essential. To achieve this goal a cross section of the aging population must be studied toward formulation of a total program applying all knowledge developed in gerontology. The program should stress disease prevention and rehabilitation followed by counseling and retraining to return the individual to an active role in his community (Rusk and Dacso).

Practical suggestions for carrying out preventive and rehabilitation programs to reduce institutional care may lie in provision of home care for elderly men and women based on some current experiments. Treatment and supervision stemming from a hospital or medical center can be expanded and extended right into the homes and communities of older people, thereby broadening the influence and usefulness of the hospital and at the same time relieving the pressing bed shortage in hospital and nursing homes (Pearlman).

The extramural care program of the Home for Aged and Infirm Hebrews in New York has thus been able to serve 89 men and women in the age range of 58 to 88 during the past four years. Such assistance is available to handicapped as well as to normal old people (Burke and Galpern). Similar services are made available under the auspices of the Michael Reese Hospital in Chicago. Home care insures the continuity of normal hospital care, since the regular medical, surgical, and laboratory services of the hospital are made available to the patient. It is essential, however, to obtain the cooperation of community and social services to meet success in such a program (Pearlman).

The Peabody Home for Aged Women, which has had seven years experience in home care, has discovered that many of the elderly women who ask for financial aid are not as destitute as they believe. Governmental and employment benefits and assistance payments provided for older people and for survivors are frequently not appreciated by women who have not had reason or opportunity to understand or engage in financial affairs. It is important that adequate counseling in such matters be made available (Laverty).

V. ECONOMICS AND EMPLOYMENT

Economic Adjustment

The most recent extensive survey of characteristics and living conditions of older people, based on a nation-wide sample of 18,000 of the 3.5 million current Federal old age insurance beneficiaries revealed that very few have any source of retirement income other than their government benefits. Most do not work because they do not feel physically able to manage even light or part-time work. Only about 1 in 20 indicated that they had retired voluntarily while in good health to engage in leisure activity. For the most part, as indicated by the fairly large pro-

portion receiving both assistance and insurance benefits, Federal insurance payments are inadequate to meet rising costs of living. The greatest need is for continuing employment and for programs and facilities to maintain the health levels of these older people (Ball).

The older person as a contributor toward productive employment is under study in the Columbia University project on conservation of human resources. Research is proceeding on work life histories of persons in selected professions and occupations, ranging from highly skilled and talented to the semiskilled and laboring groups to determine the extent and condition of their employment and their attitudes toward work. It is inappropriate to generalize concerning the older worker; it is important to define and understand him in the light of the role he plays in our economy and his conception of his contribution (Ginzberg).

In assessing economic and social problems facing the older worker, economists and sociologists considered issues of employment opportunities, attitudes toward work and retirement, and the implications of an aging labor force.

Mass production methods with resultant dilution of skills in industry and emphasis on incentive systems to decrease costs are creating major difficulties for older workers. These techniques emphasize capacities of physical dexterity and endurance which are characteristic of the young man without recognizing the assets of skill, experience, reliability, and maturity which mark the older work force. The assumption that there is a large labor reservoir of older men not employed was questioned. Recent figures indicate that 60 per cent of men aged 65 to 69 are at work. With respect to those who depend on fixed pensions, escalator provisions which automatically adjust retirement payments to rising costs of living are being tried as a partial answer to the eternal conflict between prices and income. Another approach is the investment of pension funds in common stock to reflect changes in market conditions (McConnell*).

Results of studies of the Chicago University Commission on Human Relations demonstrated that retirement could be very rewarding if workers could find the same satisfying experience at that stage that they find in their work a series of interviews with skilled craftsmen, sales clerks, steel and coal workers generally indicated that work means more than earning a living. It provides status in the community, association with others, and mental and emotional stimulation. There is however a distinct correlation between satisfaction with work and character of the work; laboring and semiskilled employees stressed fewer of the extra-economic factors and were more inclined to seek retirement as soon as possible (Friedmann*).

A corporation view of adjustment in old age presented indicated that in a sample of steelworkers of one firm only 38 per cent of unskilled or semiskilled and 24 per cent of the skilled workers wanted to retire. On the other hand, 61 per cent of the supervisory employees wanted to retire (Onoda and Gallenbeck).

The feeling of power accompanying the job is another important factor to be considered. To understand more precisely the role of work in our society, research should be directed to finding out whether work has other functions such as health maintenance and therapy, fulfillment of emotional needs, and community standing. It is important also in investigating worker attitudes toward retirement to understand such desires in relation to worker experiences with unemployment (Barron*).

Interest on behalf of older persons should be balanced with consideration of other important problems so that too much stress is not placed on problems of the aged. The older worker is only one in a number of marginal groups including young people, women, and others who are subjected to discrimination in employment. Retention of older people at supervisory levels may result in frustration of younger capable men (Ginzberg*). On the other hand, the value of older people for experience, wisdom, and judgment was stressed. A company should use the criteria of performance and productivity in evaluating its employment and retirement policies rather than merely potential physical capacity (Barrus*).

Selection and placement programs in industry should proceed at all levels and at all ages. A major research need lies in ascertaining the attitudes of workers toward employment and retirement to develop methods of employee utilization and modifications in retirement programs which will meet both the needs of individuals and the requirements of production (Gallenbeck*).

Age-Work Relationships

Work Capacity: Pressure effects on aging studied in one industry disclosed that retired workers believed that they slowed up physically as they grew older. They reported that shortly before retirement they had not been able to turn out as good a day's work as before and that they had to work harder to meet their quotas. About half admitted that they had to turn down overtime more frequently than before. An outstanding problem was the prevalent anxiety on the part of older people that they were not able to keep up with younger workers who, they believed, were concerned only with their own security (Tuckman and Lorge).

A survey of relative efficiency, conducted in a large industrial installation in Ohio covering 5,000 workers aged 20 to 70, demonstrated that generally efficiency varies with age. In job knowledge, judgment, skill,

and craftsmanship, however, rather than speed and physical endurance, the older worker compares favorably with the younger and middle-aged worker. Increased steadiness, reliability, and attendance seemed to compensate for loss in speed and endurance so that the over-all value of the older worker is not seriously diminished. In the light of such findings effective counseling is required to match qualifications of the worker with specific job requirements (Smith).

Attitudes Toward Work and Retirement: Evidence that older workers nowadays resent compulsory retirement was provided by industry studies in a large metropolitan area. Any decrease in the number of older people in the labor force, among those who are physically fit, was found to be not due to a desire to stop work but to employer resistance to hire and retain older workers. Hiring of older workers does not necessarily mean high labor cost and antiquated production methods; such conditions are largely due to unenlightened management which should learn how to fit the job to the worker (Tuckman*).

In specifically applying the problem of attitudes and meaning of work to retail trade, it was ascertained that older saleswomen in a Chicago department store found considerable challenge in selling and realized genuine satisfaction in meeting the people and closing the sale. As skill increases, there is a greater tendency to stress work values beyond that of earning a living. To many, the mere fact that a person is able to work implies youth (Bower).

A survey to ascertain attitudes toward work on the part of New York teachers proved that job satisfaction increased significantly with age. The following factors contributed to this condition: a settling down tendency; increased interest and liking for teaching; better relationships with employers and associates; and feelings of greater competence and security. On the other hand, the group indicated heavy work loads, discrimination on account of age, and inadequacy of income, security, and future prospects as items of dissatisfaction. This was particularly true for women teachers (Johnson).

Fundamental research is proceeding through a 7-year longitudinal program to determine the effect of involuntary retirement on mortality and morbidity. As a part of this large study, research teams have investigated problems of retirement in selected plants to ascertain the attitudes of workers toward retirement (Barron).

Industrial Practices

Industry is developing preretirement counseling and postretirement services.

An important aspect is medical preparation. Such a program should begin with the entry physical examination and be maintained on a continuing basis. The net effective result would be adjustment of work to meet the capacities of older people. It will pay off in terms of providing advance notice of the capacities of older people and the onset of disability (Wade).

A general analysis of several industrial firms indicated that almost all, in addition to formal retirement plans, issue informal advice explaining the plan, maintain health services, provide recreational and avocational opportunity, and continue company privileges and discounts, as well as participation in company affairs for ex-employees (E. Moore; Hewitt). Some corporations have formal programs of education for employees and their wives, including discussions on health, finance, postretirement possibilities and related subjects. A utility company and a university have jointly sponsored a series of lectures on problems ranging from retirement preparation to social adjustment (Dempster*). The civilian branch of the Wright Air Development Center (USAF) has authorized an information advisory service which undertakes to explain retirement rights and problems of postemployment (Blackburn*).

The bonds between the retired worker and his coworkers still engaged at the plant must be recognized in developing any type of retirement program and counseling system. The phenomenon of "worker nostalgia" was regularly observed in a study of 500 companies employing about 2,500 people. Many of these firms continue to mail their employees news of the company and keep in touch with them, but others have not yet appreciated the need for maintaining such relationships (McKain).

VI. WELFARE AND EDUCATION

Community Responsibility

The responsibilities of society, in terms of the community and the individual, in meeting the problems of the aged were stressed. Improved psychologic measurements and greater knowledge and understanding of the problems of the aged were marked as outstanding needs. The attitude of the public health worker was defined within the concept that a society which fosters research to save life cannot escape the responsibility for the longer years of life. One of the contributions that can be made by health workers is the investigation of the peculiarities of the illnesses of old age, psychologic implications of which cannot be ignored. New psychologic insights focusing on the individual and new testing procedures were called for to preserve and maintain the ability of aging people to utilize their capabilities (Stevenson*).

Four distinct contributions of the psychologist in meeting his community responsibility were outlined: to determine and emphasize the potentialities as contrasted with the liabilities of the older years, to match abilities of older people with job requirements,

to develop needed inventories and tests adapted to older people, and to assist in developing a continuing vigorous program of public education concerning the abilities and contributions of the aged (Pressey*).

Community programing in the past has been frustrated by personal fear or dread of old age and lack of experience with the aged as a social phenomenon. Emphasis on the aged as a group should be avoided. Segregation into groups may be a disservice to older people. In the past, the desire to give older folks a good life has led to putting them safely away in institutions, even though many wished to stay in their own homes. The problem calls for informed guidance for agencies regarding the impact of social change on the aged. It means a revision of social yardsticks which relegate the older person to a nonworking role involving loss of status (Randall*).

The public welfare agency is in an advantageous position to promote activities for the older people, coordinate existing community facilities, and establish new services where the need arises. Such an agency should be able to provide a variety of services and unique assistance which is not always within the scope of the categoric services which usually comprise a public agency program (J. Kaplan). The public welfare agency must cooperate with all community services in a group work approach (Webber).

Counseling

Major points in the discussion of counseling for older persons centered on the fact that older persons are enough different from younger ones to require adaptation of counseling techniques; understanding the older person is often difficult when the counselor is young. Counseling should be approached from a variety of points of view, with all disciplines working as a team.

The lack of understanding of what goes on in the older person's mind was pointed out. This is particularly significant because the same words have different meanings for young and old persons. Often an individual comes with a specific problem, but behind that is an unspoken problem, the understanding of which is of the essence in counseling (Weinberg*).

The need for new test procedures was raised again, in view of the fact that there are new facets to the problems which psychologists need to consider in connection with those who are psychologically older (Korchin*).

The business of a counselor is not merely to give advice. To be effective he must have a fundamental impact on the individual himself regarding his own capacities and potentialities. Counselors should spend time primarily in bringing their services to the individual's level. In studies of public employment offices, it was discovered that members of the staff were sometimes detriments to the older persons because they reflected the negative attitudes of the community (Odell*).

Four criteria for good counseling are: (1) ability of the counselor to put himself in the other person's shoes; 2) patience and the ability to listen; 3) accurate information as to the individual's capacity and his situation; 4) good judgment (Stieglitz*).

Social acceptability of a person for employment is often the greatest obstacle for his placement. Counseling should not be an attempt to do things to or for the individual, but to assist him to do things for himself. In some respects, counseling the older person is easier because he can accept reality more readily (Stieglitz*).

That counseling of older persons is effective is indicated in the results of the Cleveland Vocational Guidance Bureau, which in two and a half years has been able to put nearly 400 older workers back to work. Although there has been difficulty in placing older women, small business, retail stores, and the service trades are willing to hire older workers of either sex. Over 700 oldsters have been counseled (Wilson).

Adult Education

Basic to discussions of educational programs for older persons is an understanding of their learning capacity and their backgrounds and experiences. There is a tendency to think of older people as being incapable of absorbing new material, yet it has been shown that learning capacity does not change from 20 to 60 years and beyond, although there may be different learning processes. This stereotype has been developed because studies have dealt largely with the malfunctioning and nonfunctioning portions of the older population (Lorge*).

Furthermore, in order to achieve the kind of sympathetic and informative instruction which could be effective, the older person must accept the physiologic changes of aging, which are fully as critical as changes which occur in adolescence, adjust his aspirations to reality, recognize independence for his children and adjust to living without them, develop new relationships with spouse and friends, learn new leisure time patterns and adapt interests to extensive periods of nonproductive but none the less satisfying activity, and prepare for retirement by appropriate financial and economic insurance of income (Havighurst*).

Adult education techniques mentioned were: a college for adults at which a variety of specialized course work is offered to older people (Andrus*); classes in which formal education is combined with social and recreational activity (Salamone); and public education facilities offered under the sponsorship of the State department of education (Rabe*).

Special attention was directed toward the rehabilitation and instruction of the disabled so they might gain positions of productivity. This is especially important in dealing with the problems of institutionalized older people (LeMaire*).

Survey Methodology

Two contributions in the methodology of obtaining information from older people for purposes of study were submitted, indicating that individualized approaches yield the most complete and satisfactory results. Data were successfully gathered from and about alleged centenarians relative to their social adjustment by questionnaire and interview technique after rapport was established on the basis of personal friendship and stimulation of interest in the research (Beard).

To test relative effectiveness of invitations to obtain free chest x-rays, four types of mailed material were sent to over 2,300 public assistance recipients. Those to whom a personal card was sent in addition to the regular material responded almost twice as frequently, with more males than females answering (O. J. Kaplan).

VII. RESEARCH: STATUS AND PROSPECTS

Conquest of diseases associated with aging will result from our understanding of plain biologic facts applicable to older people and the aging process. Such diseases, like the acute ailments, can be gradually brought under public health and medical control. It is probable that arteriosclerosis can be prevented through intensive study of metabolism of arterial tissue. If we knew as much about the metabolism of such tissue as we know about processes and growth of bones, we might be able to prevent this disease as easily as we now prevent rickets (R. A. Moore*).

From the psychologic point of view, there is too wide a gap between the social needs of gerontology and the means for dealing with it. It is essential not only to appreciate the biologic man, but the psychologic and social man. It is necessary to approach the total aging problem with the platoon system of research. More assistance should be provided by government and other research supporters for encouragement of additional investigation in psychologic factors of old age (Jones*). The mental disorders of later life are not inevitable. Mental health depends upon physical health, home life, recreation, education, and economic security. Research in these areas will throw light on other problems of mental health. With the entire world as a laboratory, all peoples should be studied to grasp the sociology of later life. Possibilities are almost limitless, but research requires instruments, valid personality tests, sample surveys for the study of mental health, and reports on experience in caring for seniles in institutions and in homes (O. J. Kaplan*).

With respect to the problems of adjustment to society, it was noted that persons who consider themselves middle-aged were better adjusted than those who reported themselves as old or elderly. The self-concept is of utmost importance in dealing with the appropriate role of the individual in society. Emphasized were specific forms of education for aging. Only by preparation for living in the later years will the amount of frustration and inactivity we now find during that period be reduced. A more consistant and rational policy is essential, but the prerequisite to that end is research (Burgess*).

CURRENT COMMENT

Grant from the Forest Park Foundation to the Journal of Gernotology

Publication of additional pages in the 1953 volume of the Journal of Gerontology will be made possible through a grant from the Forest Park Foundation of Peoria, Illinois. The Journal of Gerontology is most grateful for the Forest Park Foundation's continued support.

New Research Foundation Formed

The Bjorksten Research Foundation has been formed by the Bjorksten Research Laboratories, Madison, Wisconsin, to explore problems that may not have an immediate commercial application. Among those scheduled for foundation study are the biochemical changes observed in the aging of living tissues. Four classes of foundation membership have been set up: sustaining, life, corporate, and honorary. Trustees are Johan Bjorksten, Luther L. Yeager, John B. Eisen, John H. Stephan, Rolph Darbo, John D. Ferry, and Durward O. Guth.

American Heart Association Issues New Scientific Journal

A new bimonthly scientific journal, *Circulation Research,* the only publication devoted exclusively to reports on fundamental studies related to the heart and circulation, will be issued by the American Heart Association beginning January, 1953, as a further step in the development of its professional education program. This new journal will be edited by Dr. Carl J. Wiggers, Professor and Director, Department of Physiology, Western Reserve University School of Medicine, Cleveland. Dr. Robert S. Alexander, Associate Professor of Physiology at the same institution, will be Assistant Editor.

Gerontologic Meetings

In connection with the Centennial Exercises of Washington University, St. Louis, an Institute on Aging will be held April 17 and 18, 1953, on the Washington University Campus. Among the speakers will be Dr. Robert A. Moore, Mr. Clark Tibbitts, Dr. Milton L. Barron, Dr. Joseph Tanaka, and Dr. Wilma Donahue. Chancellor Arthur H. Compton and Dr. Frank Wright will preside at two of the sessions. Discussion groups will be held on the following seven topics: physical, medical, and biologic aspects of aging; employment, labor, retirement, and security; religious programs and services; education and the learning process; living arrangements and housing; recreational needs and problems; personal and social adjustment.

Further information may be secured from Dean Willis H. Reals, University College, Washington University, St. Louis 5, Missouri.

Three lectures on Geriatric Psychiatry will be presented February 16, 1953 (H. E. Clow), February 23 (D. Rothschild), and March 2 (P. H. Stevenson), as part of the Sixth Connecticut Postgraduate Seminar in Psychiatry and Neurology at the Connecticut State Hospital, Middletown, Connecticut.

At the Eighth Session of the Australian Medical Congress held in Melbourne August 25 to 29, 1952, the problem of the medical care of the aged was discussed. Dr. W. W. S. Johnston, of Melbourne, was Chairman.

A Geriatric Symposium was presented by the Veterans Administration Center, Kecoughtan, Virginia, and the Virginia Peninsula Academy of Medicine, Newport News, Virginia, at Kecoughtan, Virginia, September 18 and 19, 1952.

An Institute on Life in Later Maturity consisting of seven lectures was held at Elllyer College, Hartford, Connecticut, in October and November, 1952.

The Frances Schervier Home and Hospital, New York, sponsored a course in geriatrics for nurses consisting of ten lectures during the months of October, November, and December, 1952.

A Symposium on Geriatrics was held at the Hospital Juárez, Mexico City, Mexico, November 9-15, 1952, under the chairmanship of Dr. Manuel Payno.

The establishment of the JOURNAL OF GERONTOLOGY was made possible by a grant from the Josiah Macy, Jr. Foundation.

The hieroglyphics, "The Beginning of the Book for Transforming an Old Man into a Youth," at the top of this editorial page, are from the Edwin Smith Surgical Papyrus, translated by Professor John Breasted, University of Chicago Press.

A Conference on Aging was held, November 13, 1952, at the Ann Lee Home, Albany, New York, under the sponsorship of the Albany County Department of Public Welfare. Panel discussions were held on the medical problems of aging and on the socio-economic problems of aging.

U.S.P.H.S. Grants in Field of Gerontology

According to an announcement by the U. S. Public Health Service Division of Research Grants and Fellowships, a total of 1,085 grants amounting to $11,266,577 were approved by the Surgeon General, following recommendations of reviewing consultants in June 1952. (Public Health Reports, *67:* 1040-1068, October 1952.) Based on title of the projects the following grants were made in the field of gerontology:

University of Colorado — E. W. Busser. Effect of aging upon the central nervous system.	$ 7,532
George Washington University, (Washington, D. C.). J. F. Fazekas. Cerebral circulation and metabolism in the aged.	12,312
Harvard University. D. M. Hegsted. Ca and P requirements of adulthood	7,560
Worcester Foundation (Worcester, Massachusetts). G. Pincus. Tissue steroids and adrenal steroidogenic activity of the aged.	10,000
Washington University (St. Louis). A. I. Lansing. Cellular calcium binding in aging.	11,826
Cornell University (Ithaca, New York). C. M. McCoy. Research upon aging.	23,598
Cornell University (Ithaca, New York). H. S. Liddell. Relation of aging to tolerance for environmental stress.	8,694
Columbia University, College of Physicians and Surgeons. H. S. Simms. Age alterations affecting death rate.	29,916
Fordham University. (New York). H. Misiak. Critical flicker frequency and old age.	4,428
Ohio State University (Columbus). S. L. Pressey. Factors leading to adjustment in old age.	9,866
University of Pittsburgh. H. S. Belding. Vascular responses to thermal stress related to age.	8,640
University of Washington (Seattle). R. J. Blandan. Effect of ovum age on the process of fertilization.	10,820
Total	$145,192

These 12 grants (1.1 per cent of the total number) represent 1.3 per cent of the total funds approved for research support.

McGregor Grant

A two-year project grant has been made by the McGregor fund to the Committee on Aging of the National Social Welfare Assembly, New York, to develop methods for determining whether a worker should or should not be retired. The Committee does not intend to do direct research but to stimulate research groups, business and industrial organizations, labor unions, universities, etc. to undertake studies and experiments in areas bearing on the subject and to coordinate and relate the separate undertakings. The Committee plans to collect and make available information regarding current practices of administering an elastic retirement policy, retirement counseling, and related subjects.

San Francisco Senior Center

San Francisco's Senior Center celebrated its fourth anniversary with the dedication of a new craft shop, October 8, 1952. Located in the Aquatic Park Pavilion, the center was opened in 1948 with the assistance of the A.W.V.S. and the Recreation and Park Department of San Francisco. A grant from the Columbia Foundation made it possible to appoint Miss Florence E. Vickery a full time director. In January of 1952 support of the project, including four branch clubs, was accepted by the Community Chest. The program is aided by the San Francisco Adult Education Division which supplies capable teachers for classes and activity groups. The craft shop is a gift of the city to the Center. Current registered membership of the center exceeds 1000. A wide variety of programs are offered under the guidance of Miss Florence E. Vickery, Director, Miss Emily W. Wooley, Counselor, and Roy Rusk.

ORGANIZATION SECTION

E. V. Cowdry, *President*
660 Kingshighway Blvd.
St. Louis 10, Missouri

Nathan W. Shock, *Secretary*
Baltimore City Hospitals
Baltimore 24, Maryland

Anton J. Carlson, *President-Elect*
University of Chicago
Chicago 37, Illinois

John Esben Kirk, *Treasurer*
5600 Arsenal Street
St. Louis 9, Missouri

Summary of the Minutes of the Seventh Annual Meeting of the Council and Members of the Corporation of the Gerontological Society, Inc.

The meeting was called to order at 1:00 p.m. on September 6, 1952, in the Executive Room of the Willard Hotel, Washington, D. C. All members of the Council were present.

Reports of the President, Treasurer, and Editor-in-Chief and the budget for 1953 were presented and accepted. Reports of the Membership Committee, Committee on Constitution and By-Laws, and the Nominations Committee were presented and approved. The following actions were taken:

It was recommended that the new By-laws presented by the Committee be adopted.

It was recommended that the Sixth Annual Scientific Meeting of the Gerontological Society, Inc. be held in the San Francisco Bay area, the Seventh Annual Scientific Meeting in St. Petersburg, Florida.

A contribution of $100.00 to the National Society for Medical Research was approved.

The Secretary was authorized to investigate the services which the National Society for Study of Communications can offer to the Gerontological Society.

Issuance of annual membership cards and certificates of membership was disapproved.

Membership dues for 1953 were maintained at $10.00; subscription to the Journal of Gerontology is to be increased from $8.00 to $10.00 per volume beginning with volume 8, 1953.

N. W. Shock
Secretary

Summary of the Minutes of the Fifth Annual Meeting of The Gerontological Society, Inc.

The meeting was called to order at 4:00 p.m. on September 6, 1952 in the Fairfax Room of the Willard Hotel, Washington, D. C. Dr. E. W. Burgess, President of the Society, acted as Chairman of the meeting. Dr. N. W. Shock acted as Secretary. The following actions were taken:

The Report of the Editor of the Journal of Gerontology was accepted. The appreciation of the Society to the Forest Park Foundation and the Second International Gerontological Congress for financial aid to the Journal during the past year was expressed.

The Report of the Membership Committee showing that 291 new members joined the Society in 1952, making a total of 870 members as of September 1, 1952, was accepted.

It was voted that the Sixth Annual Scientific Meeting of the Gerontological Society, Inc. be held in the San Francisco Bay area in conjunction with the meeting of the American Sociological Society in late August or early September 1953. The Seventh Annual Scientific Meeting was tentatively scheduled for St. Petersburg, Florida, in 1954.

The new By-Laws, proposed by the Committee, and previously circulated to all members of the Society were adopted. Under the new By-Laws (published in full in this issue), all members of the Society on September 1, 1952, become Fellows of the Professional Division. The members approved a motion that the President appoint committees to work out procedures for (a) determining requirements of Fellows of the Professional Division and policy, and (b) affiliation of organizations.

All actions of the Council were confirmed.

The following officers and members of the Council were elected:

President	E. V. Cowdry
President-Elect	Anton J. Carlson
Secretary	Nathan W. Shock
Treasurer	J. Esben Kirk

	To serve through
Biological Sciences:	
Warren Andrew	1953
Albert I. Lansing	1954
Clinical Medicine:	
Edward J. Bortz	1953
Robert A. Moore	1954
Psychological and Social Sciences:	
Oscar J. Kaplan	1953
Clark Tibbitts	1954
Social Work and Administration:	
Georgia F. McCoy	1954
George Bugbee	1955

The past president, E. W. Burgess, will also be a member of the Council for 1953.

The Society expressed appreciation to the Committee on Local Arrangements for their work in preparation for the Fifth Annual Meeting.

N. W. SHOCK
Secretary

By-laws of the Gerontological Society, Inc.

Adopted September 6, 1952

Article I

Section 1. *Offices.* The principal offices of the Corporation shall be located in the City, County, and State of New York.

The Society may maintain such other offices in such place or places within or without the State of New York as the Council may from time to time determine.

Article II

Section 1. *Divisions.* The Society shall consist of the Professional Division (Fellows) of 4 or more Sections, General Member Division, and Affiliate Organization Division. There shall be 4 Sections of the Professional Division, viz; Biological Sciences; Psychological and Social Sciences; Clinical Medicine; and Social Work and Administration.

Additional Sections of the Professional Division or other Divisions may be created by the Society upon recommendation of the Council.

Article III

Section 1. *Membership.* Membership in the Society shall be open to all persons interested in furthering the aims of the organization who meet the requirements as outlined in Section 2c of this article.

Section 2. *Classes of Membership.* There shall be 5 classes of members designated respectively Honorary Members, Fellows, Members, Affiliates, and Senior Members.

2a. *Honorary Members:* Any person who has rendered distinguished services to the sciences of Gerontology or Geriatrics may be elected an Honorary Member of the Society by the Council. Honorary Members shall pay no membership dues. They shall have the right of attending the meetings of the Society and of taking part in its discussions but they shall have no vote.

2b. *Fellows:*

1. All persons who, on September 1, 1952, were members of this Society shall be continued as members and be designated as Fellows.
2. Any person who in the immediately preceding three years has engaged in the study or practice of any aspect of Gerontology or Geriatrics may on application be elected a Fellow and assigned to one of the Professional Sections of the Society, provided
   a) They are nominated by two Fellows in good standing.
   b) They are elected by the Council on recommendation of the Committee on Membership duly appointed by the Council.

   The requirements for admission of Fellows shall be determined by the Council.

2c. *Members:* Any person may be elected to membership by the vote or assent in writing of a majority of the Council. To be eligible for membership an applicant must: (a) be interested in and sympathetic with the purposes of the Society as expressed in its Charter, and (b) nominated by 2 members of the Society. Dues of members shall be fixed in accordance with Article XI of these By-Laws.

2d. *Affiliates:* All voting members of an Affiliate Organization as hereinafter defined (Article III, Section 3) and of all local chapters of any such Affiliate Organizations shall be Affiliates of the Society. Any individual Affiliate may become a Member of the Society on payment of individual annual dues to the Society. Affiliate members shall have the right of attending meetings of the Society but shall have no vote and shall pay no dues individually.

2e. *Senior Members:* Any person who has throughout the immediately preceding five years been a Fellow of the Gerontological Society but who is no longer engaged in professional work may upon application to the Council be designated

as a Senior Member. Senior Members shall have the right of attending meetings of the Society but shall have no vote and shall pay no dues.

Section 3. *Affiliate Organizations.* Any non-profit corporation, association, or committee organized for purposes similar to those of the Society may become an affiliate of the Society, provided that (a) the officers of the Society pursuant to such regulations which may be prescribed by the Council, approve the certificate of incorporation, charter, or body of governing rules of such corporation, association, or committee, and (b) it shall agree to comply with a Charter of Affiliation to be issued by the officers of the Society containing such provisions as shall be prescribed by the Council and renewable annually.

The Council of the Society may terminate a Charter of Affiliation issued to an Affiliate Organization at any time the Council shall determine such action to be in the best interests of the Society, and the corporation, association, or committee to which such charter had been issued shall thereupon cease to have the privileges of an Affiliate Organization.

3a. Members of the Society in any area may form a local chapter and apply for affiliation.

Section 4. *Loss of Membership, Resignation, Expulsion.*

4a. Any Fellow or Member of the Society delinquent at least two years in the payment of dues shall cease to be a Member in good standing and shall not be entitled to vote or hold any office of the Society, except that such Member shall be reinstated to good standing at any time upon payment of outstanding dues for the then current year.

4b. The resignation of any Fellow or Member shall be in writing and addressed to the Secretary of the Society.

4c. Any Fellow or Member who in the opinion of the Council has violated these By-Laws or regulations prescribed by the Council or whose conduct is prejudicial to the welfare of the Society may be expelled from membership by two-thirds vote of the Council.

Section 5. *Voting.* Each Fellow and Member shall be entitled to one vote at meetings of the Society. Honorary Members, Senior Members, and Affiliate Members shall not vote. Each Affiliate Organization shall be entitled to one vote to be cast by its representative attending meetings of the Society.

Article IV

Section 1. *Membership in the Corporation.* The Members of the Corporation shall be those Fellows and/or Members elected as members of the Council. The election of a person to the Council shall likewise be an election to membership in the Corporation. No one shall continue to be a member of the Corporation after ceasing to be a member of the Council.

Every meeting of the persons who are members of the Council and of the Corporation, at which there is a quorum, shall be deemed to be a meeting both of the Council and of the Corporation, and any action taken at such a meeting shall be the action of the Council and of the Corporation. Action at such meetings shall be recorded in one set of minutes which need not distinguish between the different capacities in which action is taken.

Article V

Section 1. *Council.* The business and affairs of the Society shall be managed by a Council composed of 17 persons.

Section 2. *Council Membership.* The Council shall be composed of the President, the past President, the President-Elect, the Treasurer, the Secretary, and the Editor of the Journal of Gerontology as *ex officio* members and 11 additional members to be elected by the Fellows of the Professional Sections, Members of the general Member Division, and a representative of the Affiliate Organization Division of the Society as follows:

Two from the general Member Division
Two from each of the 4 Professional Sections
One from the Affiliate Organization Division.

Section 3. *Nominations.* The Council shall nominate candidates for election as officers of the Society and members of the Council. Additional nominations may be made by any 5 Fellows and/or Members of the Society in good standing by filing the nominations with the Secretary at least ten days before the annual meeting.

Section 4. *Quorum.* The presence in person of one-fourth of the Council members shall constitute a quorum. Actions of the Council shall be by majority vote of Council members present. The President shall preside at all Council meetings.

Section 5. *Duties of the Council.* The Council shall:

a. Have general management and control of the affairs and funds of the Society.
b. Appoint a Committee on Publications which shall have jurisdiction over all publications of the Society, including the appointment of an Editor of each such publication.
c. Appoint a committee to pass on applications of Fellows and define the guiding principles of eligibility to professional sections.
d. Recommend the annual dues for Fellows, Members, and Affiliate Organizations.
e. Prescribe the procedure for and have general supervision over the election of officers of the Society and members of the Council.
f. Provide for nominations of elected officers and members of the Council.

g. Determine the time and place of annual meetings.
h. Set up regulations for admission of corporations, associations, or committees to affiliation with the Society and define policies of affiliation.
i. Appoint additional committees to further the aims of the Society.

The Council may:

j. Determine whether or not the Treasurer is to be bonded and if so, in what amount.
k. Appoint or authorize the President to appoint committees on programs, arrangements, regional meetings, public education, research, fellowships, and such other committees as it may deem necessary.
l. Call special meetings of the Society.
m. Make decisions between meetings by majority opinion in writing.

Article VI

Section 1. *Elected Officers.* The elected officers of the Society shall be a President, a President-Elect, a Secretary, and a Treasurer. The President and President-Elect shall be Fellows of the Society.

Section 2. *Nomination.* (See Article V, Section 3).

Section 3. *Elections.* Election of officers shall be by majority vote at the annual meeting of the Society.

Section 4. *Term of Office.* All officers shall assume their duties on January 1 of each calendar year following their election and shall serve for one year or until their successor is elected and qualified.

The President-Elect shall assume the office of President on January 1 of the calendar year one year following his election.

Section 5. *Vacancies.* If the office of the President shall become vacant the President-Elect shall assume such office. If for any reason the succession of the President-Elect shall become impossible, a successor to the office of President shall be appointed by the Council for the remainder of the unexpired term of the President. If the office of the Secretary or Treasurer shall become vacant, a successor shall be appointed by the Council for the remainder of the unexpired term. If the office of President-Elect shall become vacant, a successor shall be nominated by the Council but such office shall not be filled except by confirmatory vote of the Society at the next annual meeting.

Section 6. *Duties of the President.* The President shall preside at annual and special meetings of the Society and at meetings of the Council. He shall be responsible for the administration of the business of the Society, shall be an *ex officio* member of all committees, and shall perform such other duties as are not specifically delegated to other officers or committees. He may call special meetings of the Society.

Section 7. *Duties of the President-Elect.* The President-Elect shall perform the duties of the President in the absence or disability of the President and shall be an *ex officio* member of all committees.

Section 8. *Duties of the Secretary.* The Secretary shall arrange to have written notices of all meetings sent to all members as provided in the By-Laws. He shall also act as Secretary of all meetings of the Society and of the Council.

Section 9. *Duties of the Treasurer.* The Treasurer shall receive and disburse and account for all funds belonging to the Society.

Article VII

Section 1. *Section Officers.* Each Professional Section, the General Member Division, and the Division of Affiliate Organizations may elect a Chairman and Secretary of its respective group.

1a. *Council Representatives.* Each Professional Section as well as the Division of General Members shall elect 2 representatives to the Council for a term of three years. The Division of Affiliate Organizations shall elect one member to the Council for a three-year term. Terms of office shall be arranged so that the term of office of only one representative of a Section or Division shall expire in any given year.

Section 2. *Vacancies.* If vacancies occur among representatives to the Council, successors from the same Section or Division shall be nominated by the Council and elected at the next annual meeting for the unexpired portion of such terms.

Article VIII

Section 1. *Meetings of the Society.*

1a. *Annual meetings.* Annual meetings of the Fellows and Members of the Society shall be held on the second Friday of September unless the Council designates a different day. The place of meeting shall be designated by the Council.
1b. *Special meetings.* Special meetings of the Fellows and Members of the Society may be called at any time by the President or the Council and shall be called by the President upon the written request therefor of 25 Fellows and/or Members.
1c. *Regional meetings.* The Council shall upon the request of 25 Fellows and/or Members call a regional meeting of the Society at any time and place for the presentation of programs and the promotion of personal intercourse. Such a request shall be made in writing at least six weeks before the proposed date of meeting. Such meeting shall be held in accordance with the Constitution and By-laws of the Society, and if the regular officers of the Society cannot be present the President shall appoint a committee from among the petitioners to conduct the meeting. The Com-

mittee through a Secretary chosen by them shall forward an account of the proceedings of the meeting to the official Secretary of the Society for insertion in the minutes. No general business of the Society shall be transacted at such regional meetings.

1d. *Notice of meetings.* Written notice of the time, place, and purposes of the annual meeting and all other meetings of the Members and Fellows of the Society shall be mailed or caused to be mailed by the Secretary to each Fellow and Member addressed to him at his address as it appears on the records of the Society not less than ten and not more than forty days before the meeting.

1e. *Quorum.* At all meetings of the Society, 20 Fellows present in person or by proxy shall constitute a quorum for the transaction of business, but a lesser number may adjourn the meeting to a day specified.

1f. Two *Inspectors of Election* shall be chosen at each annual meeting of the Fellows and Members of the Society to act at such meeting and at all special meetings of the Society until the succeeding annual meeting.

1g. *Reports.* At the annual meeting of the Fellows and Members of the Society, the Council shall present a report, verified by the President and Treasurer or by a majority of the members of the Council, showing the whole amount of real and personal property owned by the Society, where located and where and how invested, the amount and nature of the property acquired during the year immediately preceding the date of the report and the manner of acquisition; the amount applied, appropriated, or expended during the year immediately preceding such date, and the purposes, objects, or persons to or for which such applications, appropriations, or expenditures have been made; and the names and places of residence of the persons who have been admitted to membership in the Society during such year, which report shall be filed with the records of the Society and abstract thereof entered in the minutes of the proceedings of the annual meeting.

Section 2. *Meetings of the Council.*

2a. The annual meeting of the members of the Council shall be held each year immediately preceding the annual meeting of the Fellows and Members of the Society. Special meetings of the Council may be called by the President and shall be called by the President upon the written request of 5 members of the Council at any time.

2b. Written notice of the time and place of all meetings of the Council shall be mailed by the Secretary to each member of the Council not less than five days before the meeting. Notices of special meetings shall also state the purposes of such meetings.

Article IX

Section 1. *Official Organs.* The JOURNAL OF GERONTOLOGY shall be an official organ of the Society. All of the assets of the JOURNAL shall be the property of Gerontological Society, Inc., and all of the income and revenue of the JOURNAL OF GERONTOLOGY shall be paid or transmitted to the Treasurer of the Society and its bills shall be paid by the Treasurer upon the presentation of proper vouchers.

Article X

Section 1. *Seal.* The seal of the Corporation shall have inscribed thereon the following words and figures: "Gerontological Society, Inc., 1945."

Article XI

Section 1. *Dues.* Each Fellow and Member shall pay annual dues in an amount determined by a majority vote at the annual meeting of the Society upon recommendation of the Council. The dues for Fellows shall include the annual cost of a subscription to the JOURNAL OF GERONTOLOGY. Dues for Members may exclude subscription to the Journal of Gerontology when approved by the Council.

Honorary and Senior Members are exempt from payment of dues.

Affiliate Organizations shall pay annual dues to the Society, an amount determined by a majority vote at the annual meeting of the Society upon recommendation of the Council. The dues for Affiliate Organizations shall include the cost of at least one subcription to the JOURNAL OF GERONTOLOGY.

Article XII

Section 1. *Amendment or Repeal.* These By-Laws may be amended or repealed by the affirmative vote of at least three-fourths of the Fellows and Members present at any meeting of the Society provided the proposed amendment or repeal is approved by the Council and a written notice of the proposed amendment or repeal has been mailed to each Fellow and Member at least ten days in advance of the meeting.

Article XIII

Section 1. *Purchase, Sale, etc. of Real Estate.* No purchase of real property or sale, mortgage, or lease of the real property of the Society shall be made unless authorized by the vote of at least two-thirds of the whole number of the Council, at a meeting duly called and held.

Section 2. No sale or mortgage, other than a purchase money mortgage, of real property of the Society within the State of New York or lease thereof for more than five years, shall be made without

leave of the Supreme Court in the Judicial District in which some of the property is located.

Section 3. The provisions of the foregoing Sections 1 and 2 of this Article XIII shall not apply to real property acquired on a sale in any action or proceeding for the foreclosure of a mortgage owned by the Society or to real property acquired by the Society by deed in lieu of foreclosure of a mortgage owned, either in whole or in part, whether in certificate form or otherwise, by the Society.

The International Association of Gerontology

Proceedings of the First Conference of the European Division of the Research Committee on Biology and Medicine

Hôpital de Bavière, Liège University, Liège, Belgium

September 25-27, 1952

Edited by the Organising Committee of the Conference:

L. Brull, Chairman, A. P. Thomson, and V. Korenchevsky

Thirty-four members of gerontologic societies from various European countries who are actively engaged in gerontologic research took part in the Conference, which was financed by Lord Nuffield and Prof. Brull's Fund. Prof. Brull was elected President of the Conference.

LIST OF MEMBERS

Dr. J. Alberti, Department of Pathology, University of Bilbao, Bilbao, Spain
Dr. F. Bourlière, Laboratoire de Biologie Médicale de l'Université de Paris, Paris, France
Prof. L. Brull, Hôpital de Bavière, Clinique Médicale B, Liège, Belgium
Dr. G. Debry, Department of Geriatrics, Université de Nancy, Nancy, France
Prof. A. Delaunay, Institut Pasteur, Annexe de Garches, Garches, France
Prof. J. B. Duguid, Department of Pathology, Durham University, Royal Victoria Infirmary, Newcastle-upon-Tyne, England
Prof. P. Divry, Clinique Psychiatrique, Université de Liège, Liège, Belgium
Prof. J. Firket, Institut de Pathologie, Hôpital de Bavière, Liège, Belgium
Prof. P. Formijne, Department of Medicine, Amsterdam University, Amsterdam, Holland
Dr. T. Geill, Director, De Gamles By, Copenhagen, Denmark
Dr. E. Gillis, Geriatric Unit, The General Hospital, Sunderland, England
Prof. A. Haddow, Director, Chester Beatty Research Institute, London, England
Dr. L. J. Harris, Dunn Nutrition Laboratory, University of Cambridge, Cambridge, England
Prof. R. Herbeuval, Department of Geriatrics, Université de Nancy, Nancy, France
Dr. A. D. Herschberg, Centre d'Etudes et de Recherches Gerontologiques, Paris, France
Dr. S. Hirsch, Department of Pathology, Brussels University, Brussels, Belgium
Dr. J. A. Huet, 1 Place d'Ilna, Paris, France
Prof. E. Jalavisto, Department of Physiology, University of Helsinki, Helsinki, Finland
Prof. B. C. P. Jansen, Institute of Nutrition, Amsterdam University, Amsterdam, Holland
Prof. T. Kemp, Institute of Genetics, University of Copenhagen, Copenhagen, Denmark
Prof. A. Kennedy, Department of Psychiatry, Durham University, Royal Victoria Infirmary, Newcastle-upon-Tyne, England
Dr. V. Korenchevsky, Gerontological Research Unit, c/o Department of Physiology, Oxford University, Oxford, England
Prof. G. O. E. Lignac, Department of Pathology, University of Leiden, Leiden, Holland
Dr. W. H. Lloyd, Geriatric Unit, The General Hospital, Sunderland, England
Dr. J. Loiseleur, Institut Pasteur (annexe), Paris, France
Dr. O. Olbrich, Geriatric Unit, The General Hospital, Sunderland, England
Dr. M. Pañella-Casas, Hospital de Nuestra Señora de la Esperanza, Barcelona, Spain
Prof. P. Pichot, Centre Psychiatrique St. Anne, Université de Paris, Paris, France
Prof. P. Rondoni, Department of Pathology, University of Milan, Milan, Italy
Prof. J. Roskam, Clinique A, Hôpital de Bavière, Liège, Belgium
Prof. J. G. Sleewijk, 32 Frankenstraat, The Hague, Holland
Prof. A. P. Thomson, Department of Therapeutics, University of Birmingham, Birmingham, England
Prof. E. van Campenhout, Institute of Anatomy, Louvain University, Louvain, Belgium
Prof. F. Verzar, Institute of Physiology, Basel University, Basel, Switzerland

PROGRAM

At the sessions of the Subcommittees the following research schemes were proposed for informal round-table discussions:

I. *Subcommittee on Clinical Pathologic Physiology.*

Participants: Chairman, L. Brull; members, F. Bourlière, A. Delaunay, J. B. Duguid, P. Formijne, T. Geill, A. Herschberg, S. Hirsch, J. Huet, E. Jalavisto, G. Lignac, H. Lloyd, J. Loiseleur, O. Olbrich, J. Roscam.

Round-table Discussions

1. J. Duguid. Arteriosclerosis.
2. J. Duguid. Emphysema.
3. T. Geill. Studies on blood coagulation with special reference to the occurrence of thrombosis in old people.

Publication in this issue was made possible by a grant from the International Association of Gerontology.

4. J. Huet and A. Herschberg. La Polypeptidémie: moyen de dèpistage précoce du viellissement.
5. G. Lignac. The biology of death.
6. J. Loiseleur. Plan des recherches experimentales pour la mise au point du serum cytotoxique.
7. E. Jalavisto. Faintness in old age.
8. O. Olbrich and I. Renney. Changes of renal functions of the aged.

II. *Subcommittee on Endocrinology.*
Participants: Chairman, A. P. Thomson; members, F. Bourlière, L. Brull, T. Geill, A. Herschberg, J. Huet, V. Korenchevsky, W. H. Lloyd, O. Olbrich, E. van Campenhout, F. Verzar.

Round-table Discussions

1. F. Bourlière. Thyroid function in old age and in arteriosclerosis, human and experimental.
2. E. van Campenhout. Influence of aging on the structure and function of the endocrine glands.
3. J. Huet and A. Herschberg. Les implants polyhormonaux dans la prevention de la sénèscence.

III. *Subcommittee on Cellular Biology.*
Participants: Chairman, A. Haddow; members, J. Firket, L. J. Harris, T. Kemp, V. Korenchevsky, P. Rondoni, E. van Campenhout.

Round-table Discussions

1. A. Haddow. Enzymatic constitutions of cells with aging.
2. V. Korenchevsky. Morphologic changes of cells with aging.
3. V. Korenchevsky. Role of the smallest metahyperplastic nests of cells in development of tumors in senescence and the causes producing these nests.

IV. *Subcommittee on Psychiatry.*
Participants: Chairman, A. Kennedy; members, L. Brull, P. Divry, E. Gillis, V. Korenchevsky, W. H. Lloyd, O. Obrich, P. Pichot, J. Roskam, A. P. Thomson.

Round-table Discussions

1. A. Kennedy and O. Olbrich. A psychosomatic approach to the problem of mental inefficiency in old age: plan for an investigation of the relation between psychologic changes and physical variables in the psychotic incidence of old age.
2. P. Divry. Senile plaques in the brain.

V. *Subcommittee on Nutrition and Metabolism.*
Participants: Chairman, B. C. P. Jansen; members, F. Bourlière, L. Brull, L. Harris, E. Jalavisto, V. Korenchevsky, F. Verzar.

Round-table Discussions

1. B. Jansen. Nutrition in old age.
2. B. Jansen. Nutritional experiments on rats.
3. L. Brull. Thyroxin and nutrition in mice.
4. A. P. Thomson. Studies in the biochemistry of the aged.
5. V. Korenchevsky. Metabolic and gastro-intestinal autointoxications in the processes of aging.
6. L. Brull. Optimal diet for the elderly (General discussion).

VI. *General discussion and business meeting.*
Prof. Thomson, the Chairman of the European Division of the Research Committee, in closing the Conference, summarised the opinions of the members on the value of the Conference as follows:

"The Conference was an experiment and there is no doubt that it has proved a great success. The unusual features of its organisation were its aim (round-table discussion on research projects) and that we extended invitations to a few distinguished people who were not directly concerned with the problems of gerontology, although the character and quality of their work had suggested that it would be interesting to have their comments on those problems. Their contributions have added to the variety of our proceedings and were very stimulating. We are all greatly indebted both to Prof. Brull and Dr. Korenchevsky for the work they have done in connection with it. I have no doubt that the General Research Committee (President: Dr. W. O. Thomson) and the Governing Body of the International Association of Gerontology (President: Dr. E. V. Cowdry) would like to consider the tentative conclusions of the members and their suggestions for the future."

The Conference approved the following:

I. Two new sub-committees were established in the European Division of the Research Committee to study psychiatry and genetics.
Prof. Kennedy and Prof. Kemp, respectively, were elected Chairmen of these sub-committees.

II. It is suggested that the General Research Committee and the Governing Body consider the problem of establishing sub-committees analogous to those in the European Division so as to facilitate international interchange of opinions and results.

III. Sessions for the Research Committee should be organised in connection with the Third International Gerontological Congress, which will be held in July, 1954, in Oxford. The Research Committee would prefer these Sessions to take place at the same time as the usual meetings of the Congress because they believe they would not interfere with the Congress proceedings and only comparatively small proportions of the members of the Congress would be interested in the activities of the members of the Research Committee.

IV. The following subjects were suggested tentatively for round-table discussion at the Research Sessions of the Third Congress:
1) Changes in cells with aging, with a particular examination of the compensatory hypertrophy in the cells of tissues and organs in cases of degenerative changes and diseases accelerating the processes of aging (suggested by V. Korenchevsky and L. Brull).
2) Changes in the function of the thyroid in, and effects of, its hormone and of iodine compounds on the processes of aging, in particular changes in the span of life, growth, nutrition and also on arteriosclerosis (suggested by L. Brull and F. Bourlière).
3) The psycho-somatic approach in the problem of mental inefficiency in the elderly (suggested by A. Kennedy and O. Olbrich).
4) Genetic aspects of aging (suggested by T. Kemp and V. Korenchevsky).
It was agreed that the Research Committee have discretion to alter these if events or new developments made it desirable.

V. Various research projects, as detailed in the program, were considered in the round-table discussions.
As a result of discussion certain alterations were made in the two projects as follows:—
1) The project suggested by G. O. E. Lignac was modified (J. B. Duguid and J. Firket) as follows:—
"A geographic investigation of the causes of death in cases suitable for statistical examination, preferably organised and directed by a Permanent Committee of the specialists."
2) The project suggested by E. Jalavisto was amended to the following:
"Dizziness and falling fits in the elderly" (A. P. Thomson, O. Olbrich, T. Geill).

BOOK REVIEWS

HISTOLOGY, HISTOPATHOLOGY, AND FUNCTION OF THE SENILE OVARY, by Hannes Sauramo, Annales Chirurgiae et Gynaecologiae Fenniae, vol. *41:*, suppl. 1, Helsinki, Finland, 1952, 66 pages.

Despite the recent surge of interest in problems of aging, gerontology still depends to a large extent on subjective opinions and impressions. The need for reliable data relating to the morphologic, chemical, and physiologic changes of aging has been repeatedly stressed. It is, therefore, particularly refreshing to encounter a systematic study such as this. In a highly compressed monograph Dr. Sauramo has described and evaluated the age changes (microscopic) in human ovaries, uteri, and other components of the female reproductive system.

The studies are based on examination of 10 subjects varying in age from 47 to 74 years, and care was taken to avoid, in so far as possible, the use of pathologic material. The monograph is profusely illustrated with photomicrographs which, unfortunately, have not been well reproduced. The author makes special points of the tendency of both ovaries and uterus to undergo malignant transformations in aging and of a possible disturbance of lipid metabolism.

Although this is a specialized piece of work, most serious gerontologists should profit from studying it.

A. I. LANSING
Washington University
School of Medicine
St. Louis, Missouri

PROBLEMS OF AGING, TRANSACTIONS OF THE FOURTEENTH CONFERENCE ON AGING, N. W. Shock, Editor, Josiah Macy, Jr. Foundation, New York, 1952, 138 pages, $3.00.

Problems of Aging, edited by Nathan W. Shock, the fifth published Josiah Macy, Jr. Foundation transactions on the subject, is a discussion by gerontologic experts on their own plane. It presupposes an adequate fund of insight and information in the field of aging while offering new students a rapid transit view of a complex and clarifying scene. In some respects it is an accurate mirror of a scientific meeting, being episodic, eclectic, and revealing.

These staged informal discussions of fresh inquiry are reflective without cynicism. The recurrent vagaries of ideation, which could be distracting, contribute to the spontaneity, with a satisfactory sense of sequence.

The structure of the report follows the general pattern of the Second International Gerontological Congress: Biology and Medicine; Sociology, Psychology, Education, and Religion; Economics, Employment and Welfare; and Medical Services, Hygiene and Housing. In each section there are some completed studies and many experimental anticipations, a modicum of clinical impressions, and a large measure of sociologic observations. Each conclusion is bordered by a perimeter of less formalized ideas.

The latter-hour consideration of the personalized statements is that despite the casual air there is much here that would be difficult to find elsewhere. Its generalizations can arise only from extensive detailed investigations. The international essence is valuable as well as reassuring. Such phrases as the fact that the elderly must be maintained as "ordinary members of the community," that old age "is an artefact of our culture" and that custodial homes might be "greenhouses for sickly plants of old age" could have been made only by those qualified by long study. The cast of the panel is good programming.

In summary, this brief work maintains a continuity which to those in the field is a necessity and to others it offers a precise fund of present and future knowledge.

J. T. FREEMAN
Philadelphia, Pa.

BOOKS RECEIVED

Books received since October 1, 1952, are acknowledged in the following list. In so far as space permits, some will be selected for review in a later issue.

Administration of Homes for the Aged, edited by Kurt G. Herz and Morris Zelditch, Council of Jewish Federations and Welfare Funds, 165 West 46 Street, New York, 116 pages, mimeographed, $2.25.

Atlas of Spatial Vector Electrocardiography, by J. Willis Hurst and Grattan C. Woodson, Blakiston Company, Inc., New York, 1952, 214 pages, $6.00.

Digest of Study Report on Old Age Project, 1950-1951, by Wilma Winnick, Community Service Society of New York, 105 East 22 Street, New York, 59 pages, mimeographed.

Food Guide for Older Folks, Home and Garden Bulletin No. 17, Bureau of Human Nutrition and Home Economics, U. S. Department of Agriculture, Washington, D. C., February, 1952, 16 pages, paper bound, 5¢.

Morbus Alzheimer and Morbus Pick, A Genetic, Clinical and Patho-Anatomical Study, by Torsten Sjögren, Hakon Sjögren, and Ake G. H. Lindgren, Ejnar Munksgaard, Copenhagen, 1952, 152 pages, paper bound, 25 Swedish crowns.

Pharmacology in Clinical Practice, by Harry Beckman, W. B. Saunders Company, Philadelphia, 1952, 839 pages with 125 figures, $12.50.

Rheumatic Diseases, Diagnosis and Treatment, by Eugene F. Traut, C. V. Mosby Company, St. Louis, 1952, 942 pages, $20.00.

Sheltered Workshops and Homebound Programs, A Handbook, the National Committee on Sheltered Workshops and Homebound Programs, 15 West 16 St., New York 11, N. Y., 1952, 71 pages, 13 pages appendix, paper cover.

Yearbook of Jewish Social Services, Council of Jewish Federations and Welfare Funds, 165 W. 46 St., New York 36, N. Y., 1952, 41 pages, 39 pages appendix, paper cover, $1.00.

INDEX TO CURRENT PERIODICAL LITERATURE

NATHAN W. SHOCK
Gerontology Section
National Heart Institute
National Institutes of Health

The subject categories are those in *A Classified Bibliography of Gerontology and Geriatrics* by Nathan W. Shock published by Stanford University Press, Stanford, California (1951). Only major headings are used and the Roman numerals correspond to those given in the bibliography. In so far as possible, references are classified according to organ systems. Thus most of the material on Geriatrics will be found under the organ system involved in the disease. Cross references are indicated by number at the end of each section. When available, abstract references are given *(B.A.—Biological Abstracts; P.A.—Psychological Abstracts;* and *P.I.—Population Index)*. Abbreviations for journals are those used in *A World List of Scientific Periodicals Published in the years 1900-1933*, 2nd Edition. For journals not listed, abbreviations were devised according to the general rules used in the above source. It is impossible to cover all journals and list all papers concerned with aging and the aged. Authors and publishers are requested to call attention to publications or to send reprints to the Gerontology Section, Baltimore City Hospitals, Baltimore, Maryland. The assistance of the Forest Park Foundation, Peoria, Illinois, in the preparation of these materials is gratefully acknowledged.

GERONTOLOGY

7829. Barnard, C. I.: *The Rockefeller Foundation; a review for 1950 and 1951.* The Foundation, New York, 1952, pp. 66-68.

7830. Desmond, T. C. (Chairman): *Age is no barrier.* N. Y. State Joint Legis. Commit. on Probl. of Aging, Legis. Doc. No. 35, 1952, 171 pp.

7831. Geill, T.: Anden internationale gerontologiske kongres. *Ugesk. Laeg., 114:* 156-157, 1952.

7832. Ragazzi, C. A.: La sopravvivenza e la senescenza nell'aspetto igienico sociale. *Riv. Geront. Geriat., 2:* 159-194, 1952.

7833. Renaud, M.: Considérations préliminaires à l'étude de la sénescence. *Bull. Acad. Méd., Paris, 135:* 586-587, 1951.

7834. Simoni, R.: I domani sembrano innumerevoli. *Longevità, 1:* 1, May-June 1952.

7835. Spina, G.: L'uomo nelle sue varie età e nella vecchiaia. *Riv. Geront. Geriat., 2:* 151-158, 1952.

7836. U. S. Federal Security Agency: *Fact book on aging.* Committee on Aging and Geriatrics, Govt. Print. Off., Wash., 1952, pp. 1-62.

7837. Zironi, —.: Il problema biologico della senescenza. *Riv. Geront. Geriat., 2:* 112, 1952.

7838. Anonymous: Baltimore city commission on aging is appointed. *Baltimore Hlth. News, 29:* 49, 1952.

7839. Anonymous: La gerontologia e geriatria nei congressi; II Convegno Italiano di gerontologia e geriatria. *Riv. Geront. Geriat., 2:* 109-113, 1952.

7840. Anonymous: Old age in northern Ireland. *Lancet, 1:* 1118-1119, 1952.

II. CLIMATE

7841. Altland, P. D., and B. Highman: Effect of repeated acute exposures to high altitude on longevity in rats. *Amer. J. Physiol., 168:* 345-351, 1952.

7842. Stur, D.: Meteorologische Frontdurchgänge und klinische Exitusfälle in einem Wiener Grosspital. *Wien. klin. Wschr., 63:* 957-961, 1951.

IV. LONGEVITY

(case reports, drugs, heredity, marriage, occupation, and sex differences)

7843. Dahlberg, G.: (Mortality of alcoholics.) *Svenska. Läkartidn., 49:* 112-118, 1952.

7844. Lamache, A., H. Davost, —. Chuberre, and P. Delalande: La sénilité précoce des alcooliques. *Bull. Acad. Méd., Paris, 136:* 31-33, 1952.

See also Nos. 7871, 8306.

IV-C. LONGEVITY: *Comparative Physiology*

7845. Angel, F.: *Vie et moeurs des amphibiens.* Payot; Paris, 1947, 317 pp.

7846. Angel, F.: *Vie et moeurs des serpents.* Payot; Paris, 1950, 319 pp.

7847. Dobell, C., R. A. Neal, and C. A. Hoare: Researches on the intestinal protozoa of monkeys and man. XII. Bacterial factors influencing the life history of *Entamoeba histolytica* in cultures. *Parasitology, 42:* 16-39, 1952.

7848. Dutt, S. C., and H. D. Srivastava: On the morphology and life history of a new mammalian blood-fluke-*Ornithobilharzia dattai* n. sp.; preliminary report. *Parasitology, 42:* 144-150, 1952.

7849. Olitzki, A. L.: The determination of the most probable numbers of streptomycin-fast cells in brucella cultures and their variability in growing and ageing cultures. *J. gen. Microbiol., 6:* 166-174, 1952.

7850. Otis, E. M., and R. Brent: *Equivalent ages in mouse and human embryos.* Univ. of Rochester Atomic Energy Proj., Contract W-7401-eng-49, UR-194, April 1952, pp. 1-34.

7851. Rees, G.: The structure of the adult and larval stages of Plagiorchis (*Multiglandularis megalorchis* n. nom.) from the turkey and an experimental demonstration of the life history. *Parasitology, 42:* 92-113, 1952.

7852. Ulrich, H.: Abtötung von Drosophilaeiern verschiedenen Alters durch partielle Röntgenbestrahlung. *Naturwissenschaften, 38:* 530, 1951.

IV-H. Longevity: *Mortality Rates*

7853. Amyot, R.: Sur des statistiques en mortalité par tuberculose. *Un. méd. Can., 81:* 3-4, 1952.

7854. France. Institut National de la Statistique et des Etudes Economiques: Les causes de décès en 1950; résultats provisoires suivant le sexe et l'âge établis par l'I.N.S.E.E. *Bull. Mens. Statist. d'Outre-Mer,* Suppl., 1-9, Jan.-Mar. 1952. Abstr: *P. I., 18:* No. 1312, 1952.

7855. Haenszel, W. M.: A brief discussion of Connecticut life tables. *Conn. Hlth. Bull., 62:* 175-179, 1948. Abstr: *P. I., 15:* No. 1266, 1949.

7856. Houser, P. M., and J. A. Beegle: *Mortality differentials in Michigan.* Mich. State Coll., Agric. Exper. Station, Dept. of Sociol. & Anthrop., East Lansing, Mich., Feb. 1951, Spec. Bull. 367, 62 pp.

7857. Institute of Actuaries: Continuous mortality investigation; annuitants' experience. *J. Inst. Actu., 74:* (Part 1, 338), 126-144, 1948. Abstr: *P. I., 15:* No. 763, 1949.

7858. Jalavisto, E.: (The biologic age and life expectancy.) *Duodecim, 68:* 1-12, 1952.

7859. Lew, E. A.: Mortality statistics for life insurance underwriting. *J. Amer. statist. Ass., 43:* 274-290, 1948. Abstr: *P. I., 15:* No. 239, 1949.

7860. Logan, W. P.: Mortality from coronary and myocardial disease in different social classes. *Lancet, 1:* 758-759, 1952.

7861. Lotte, A., and M. Moine: La mortalité par tuberculose dans les grandes villes françaises en 1946. *Bull. Inst. nat. Hyg., 2:* 253-268, 1947. Abstr: *P. I., 15:* No. 720, 1949.

7862. Metropolitan Life Insurance Company: Longevity of industrial population at all-time high. *Statist. Bull. Metrop. Life Insur. Co., 33:* 1-11, Sept. 1952.

7863. Moine, M.: Quelle influence aurait sur la longévité la suppression de la mortalité par tuberculose et par cancer? *All. nat. Dépop., 2:* 94-103, 1948. Abstr: *P. I., 15:* No. 1, 1949.

7864. Moine, M.: Sur l'augmentation de quelques causes de décès; appareil circulatoire et lésions intracraniennes d'origine vasculaire. *Rev. Path. comp., 51:* 14-20, Dec. 1951.

7865. Molony, J. B. De W.: Mortality from appendicitis in Scotland; 1901-1945. *Edinb. med. J., 55:* 153, 1948. Abstr: *P. I., 15:* No. 186, 1949.

7866. Moriyama, I. M.: Is diabetes mortality increasing? *Publ. Hlth. Rep., Wash., 63:* (41), 1334-1339, 1948. Abstr: *P. I., 15:* No. 187, 1949.

7867. Rigdon, R. H., and H. Kirchoff: Accuracy of death certificates for establishing the frequency of cancer as shown by autopsy. *Texas Rep. Biol. Med., 9:* 652-659, 1951. Abstr: *P. I., 18:* No. 1333, 1952.

7868. Senti, A., and H. O. Pfister: Tuberkulosesterblichkeit in Zürich. *Statist. Nachr., 23:* 133-180, Dec. 1946. Abstr: *P. I., 15:* No. 738, 1949.

7869. Springett, V. H.: An interpretation of statistical trends in tuberculosis. *Lancet, 1:* 521-522; 575, 1952. Abstr: *P. I., 18:* No. 1335, 1952.

7870. Sutter, J., and L. Tabah: La mortalité, phénomène biométrique. *Population, 7:* 69-94, 1952. Abstr: *P. I., 18:* No. 1626, 1952.

7871. U. S. Federal Security Agency. Public Health Service. National Office of Vital Statistics: Demographic differentials in cancer mortality in urban and rural areas of the United States; 1940. *Vit. Statist., Spec. Rep., Selected Studies, 33:* 239-253, Sept. 1952.

7872. U. S. Federal Security Agency. Public Health Service. Office of Vital Statistics: United States summary of vital statistics; 1949. *Vit. Statist., Spec. Rep., Nat. Summaries, 36:* (22), 469-515, 1952.

7873. U. S. National Office of Vital Statistics: *Vital statistics of the United States; 1946. Part I. Natality and mortality data for the United States tabulated by place of occurrence with supplemental tables for Hawaii, Puerto Rico, the Virgin Islands and Alaska. Part II. Natality and mortality data for the United States tabulated by place of residence.* U. S. Govt. Print. Off., Washington, 1948, Part I, LVII, 219 pp.; Part II, X, 647 pp. Abstr: *P. I., 15:* No. 600, 1949.

See also Nos. 7843, 8060, 8085, 8101, 8136, 8253.

IV-I. LONGEVITY: *National Groups*

7874. Austria. Statistisches Zentralamt: Die Todesursachen im Jahre 1947. *Statist. Nachr., 3:* 216-217, 1948. Abstr: *P. I., 15:* No. 709, 1949.

7875. Bakács, T.: (Birth and death rates in Budapest in 1945-1946.) *Orv. Lapja, 2:* 1284-1286, Oct. 15, 1946. Abstr: *P. I., 15:* No. 92, 1949.

7876. Breil, J.: Les personnes âgées classées suivant le nombre de leurs enfants survivants de tous âges. *All. nat. Dépop., 2:* 133, 1948. Abstr: *P. I., 15:* No. 1, 1949.

7877. Burma. Director of Health Services: *Vital statistics of the towns of Burma for the month of September 1951.* Burma Gaz., Suppl., Dec. 1951, pp. 910-916. Abstr: *P. I., 18:* No. 1261, 1952.

7878. Canada. Dominion Bureau of Statistics: Life tables for Canada and regions, 1941 and 1931. *Vit. Statist., Anal. Rep. No. 4,* Ottawa, 1947, 77 pp. Abstr: *P. I., 15:* No. 237, 1949.

7879. Delaporte, P.: Evolution en France et à l'étranger de la mortalité des vieillards. *All. nat. Dépop., 2:* 104-109, 1948. Abstr: *P. I., 15:* No. 1, 1949.

7880. Denmark. Statistiske Departement: (Vital statistics for 1936 and life table for 1931-1935). *Statist. meddelelser, 102:* (5), —, 1937. Abstr: *P. I., 4:* No. 67, 1938.

7881. Denmark. Statistiske Departement: *(Vital statistics, 1950.)* Bianco Lunos Bogtrykkeri, København, 1952, 69 pp. Abstr: *P. I., 18:* No. 1227, 1952.

7882. Dulac, R.: Ajustement analytique des tables de mortalité. *Bull. trim. l'Inst. Actuar. Franc.,* No. 185, 383-454, 1948. Abstr: *P. I., 16:* No. 1837, 1950.

7883. England and Wales. General Register Office: *Quarterly returns; births, deaths and marriages, population estimates; quarter ended 31st December 1951.* H. M. Stationery Off., London, 1952, No. 412, 37 pp. Abstr: *P. I., 18:* No. 1255, 1952.

7884. France. Institut National de la Statistique et des Etudes Economiques: La mortalité en 1947 d'après les statistiques provisoires de causes de décès. *Bull. Statist. gén. Fr., 36:* (Suppl.), 273-301, Oct.-Dec. 1948. Abstr: *P. I., 15:* No. 716, 1949.

7885. Galvani, L.: Tavole di mortalita della popolazione italiana 1930-32. *Ann. Statist.,* Studi di demografia, 1937, Serie VII, Vol. I. Abstr: *P. I., 3:* No. 1342, 1937.

7886. Germany. Reichtsgesundheitsamt: Hauptergebnisse der Todesursachenstatistik im Deutschen Reiche für das Jahr 1933 mit einem Anhang für das Saarland für die Jahre 1932 und 1933. *Reichsgesundheitsblatt,* (Statistische Sonderbeilage), *11:* (35), 112-127, Aug. 25, 1936. Abstr: *P. I., 3:* No. 517, 1937.

7887. Germany. Württemberg-Baden. Statistisches Landesamt: Die Sterblichkeit vor und nach dem Kriege in Württemberg-Baden. Vorläufige Ergebnisse. *Statist. Monatsh. Württemb.-Baden, 2:* 211-214, 1948. Abstr: *P. I., 15:* No. 717, 1949.

7888. Harbitz, G.: (Post-war mortality among industrial insured lives in Norway.) *Skand. Aktuar.,* No. 3-4, 152-157, 1951. Abstr: *P. I., 18:* No. 1316, 1952.

7889. India. Madras. Director of Public Health: *Report on the health conditions in Madras State; 1949.* Govt. Press, Madras, 1951, iv, 174 pp. Abstr: *P. I., 18:* No. 1318, 1952.

7890. India. Public Health Commission: *Annual report of the Public Health Commission with the government of India for 1945.* Manager of Publications, Delhi, 1947, iv, 91 pp. Abstr: *P. I., 15:* No. 130, 1949.

7891. Johansson, B.: *Statistique danoise des maladies et des causes de décès.* Munksgaard, København, 1946, 292 pp. Abstr: *P. I., 15:* No. 176, 1949.

7892. Kannisto, V.: (Causes of early death in Finnish males.) *Duodecim, 67:* 1108-1112, 1951.

7893. Malta. Medical and Health Department: *Report on the health conditions of the Maltese Islands and on the work of the Medical and Health Department including the emergency medical services for the year 1946.* Govt. Print. Off., Valletta, 1948, 58 pp. Abstr: *P. I., 15:* No. 102, 1949.

7894. Northern Ireland. Ministry of Health and Local Government: *Report on health and local government administration in Northern Ireland during the period 1st April 1938 to 31st December 1946.* H. M. Stationery Off., Belfast, 1948, x, 426 pp. Abstr: *P. I., 15:* No. 119, 1949.

7895. Norway. Statistisk Sentralbyrå: *(Statistical yearbook for Norway, 1946-1948. Vols. 65-67.)* Kommisjon hos H. Aschehoug and Co., Norges Offisielle Statistikk X, 162, Oslo, I, 1948, 34, 476 pp. Abstr: *P. I., 15:* No. 106, 1949.

7896. Ottaviani, G.: Sulle tavole di mortalità. *G. Instit. ital. Attuari, 20:* 66-76, 1942. Abstr: *P. I., 15:* No. 765, 1949.

7897. Philippine Medical Association: Mortality trends during the quinquennium 1946-1951. *J. Philippine med. Ass., 27:* 522-524, 1951. Abstr: *P. I., 18:* No. 1329, 1952.

7898. Polman, A.: *(Trends and present state of mortality in the Netherlands and Belgium.)* Gravenhage, 1951, 70 pp. Abstr: *P. I., 18:* No. 1330, 1952.

7899. Roberts, G. W.: A life table for a West Indian slave population. *Population Stud., 5:* 238-243, 1952. Abstr: *P. I., 18:* No. 1366, 1952.

7900. Sadie, J. L.: Differential mortality in South Africa. *S. Afr. J. Econ., 19:* 361-369, 1951. Abstr: *P. I., 18:* No. 1367, 1952.

7901. Senti, A.: Zürcher Sterbetafeln 1926-33 bis 1936-45. *Zürcher statist. Nachrichten, 24:* 133-188, 1947. Abstr: *P. I., 15:* No. 243, 1949.

7902. Skirgaila, K.: *Die Sterbefälle nach Monaten in der Schweiz, 1901-1940.* Zürich, 1949, 113 pp. Abstr: *P. I., 18:* No. 1334, 1952.

7903. Wegmüller, W.: *Die Sterblichkeit der schweizerischen Bevölkerung nach Zivilstand, Landesteilen und Todesursachen.* Eidgenössisches Statistisches Amt., Bern, 1950, 17 pp. Abstr: *P. I., 18:* No. 1338, 1952.

V. Metabolism

7904. Aikawa, J. K., G. T. Harrell, and B. Eisenberg: The exchangeable potassium content of normal women. *J. clin. Invest., 31:* 367-369, 1952.

7905. Bogdonoff, M. D., M. P. Nichols, and N. W. Shock: Calcium balance in the aged male. *Fed. Proc., Baltimore, 11:* 15, 1952. Abstr: *B. A., 26:* No. 20622, 1952.

7906. Crandall, R. R., and A. H. Smith: Tissue metabolism in growing birds. *Proc. Soc. exp. Biol., N. Y., 79:* 345-346, 1952. Abstr: *B. A., 26:* No. 24137, 1952.

7907. Deane, N.: The intracellular water in man. *J. clin. Invest., 30:* 1469-1470, 1951. Abstr: *B. A., 26:* No. 17454, 1952.

7908. Henstell, H. H., and R. I. Freedman: An inhibitor of desoxyribonuclease in human white blood cells and bone marrow cells and its relationship to cellular maturity. *Science, 115:* (2987), 357-358, 1952.

7909. Herrick, E. H., and K. Brown: Lowered tensile strength and collagen levels in tissues following discontinuation of male sex hormone. (Abstract.) *Poult. Sci., 31:* (2), 191-193, 1952. Abstr: *B. A., 26:* No. 27927, 1952.

7910. Kotschevar, L. H.: Nitrogen utilization in older men. *J. Amer. diet. Ass., 28:* 305-307, 1952.

7911. Kuriaki, K., and C. J. Kensler: Effect of age and adrenalectomy on the D-amino acid oxidase activity of rat liver. (Abstract.) *Fed. Proc., Baltimore, 11:* 365-366, 1952. Abstr: *B. A., 26:* No. 27819, 1952.

7912. McCashland, B. W.: A study of metabolism changes in young rats. *Growth, 15:* 1-9, March 1951.

7913. Medvedev, ZH. A.: (Problem of auto-restoration and ageing of intracellular proteins.) *Usp. sovrem. biol., 33:* 202-207, 1952.

7914. Ohlson, M. A., W. D. Brewer, L. Jackson, P. P. Swanson, P. H. Roberts, M. Mangel, R. M. Leverton, M. Chaloupka, M. R. Gram, M. S. Reynolds, and R. Lutz: Intakes and retentions of nitrogen, calcium and phosphorus by 136 women between 30 and 85 years of age. *Fed. Proc., Baltimore, 11:* 775-783, 1952.

7915. Reifenstein, E. C., Jr. (Editor): *Metabolic interrelations; transactions of the third conference.* Josiah Macy Jr. Found., New York, 1951, 294 pp.

7916. Robertson, J. D., and D. D. Reid: Standards for the basal metabolism of normal people in Britain. *Lancet, 1:* 940-943, 1952.

7917. Steele, J. M.: Body composition with special reference to fat and water content. (Abstract). *Geriatrics, 7:* 248, 1952.

7918. Anonymous: Standards for basal metabolism. *Lancet, 1:* 954-955, 1952.

See also Nos. 7947, 7956, 8030.

VI. Nutrition

7919. Begulristain, M. A.: La dieta normal en la senescencia. *Rev. méd. Córdoba, 40:* 53-54, 1952.

7920. Cavalieri, U.: Alimentazione e vecchiaia. *Longevitá, 1:* 27-28, May-June 1952.

7921. Lang, C. A. and B. F. Chow: Retention of of vitamin B_{12} after administration to subjects of different ages. *Fed. Proc., Baltimore, 11:* 88, 1952. Abstr: *B. A., 26:* No. 20680, 1952.

7922. Mertz, E. T., E. J. Baxter, L. E. Jackson, C. E. Roderuck and A. E. Weis: Essential amino acids in self-selected diets of older women. *J. Nutrit., 46:* 313-322, 1952. Abstr: *B. A., 26:* No. 20711, 1952.

7923. Rice, C. O., and J. H. Strickler: Parenteral nutrition in elderly surgical patients. *Geriatrics, 7:* 232-240, 1952.

7924. Tuttle, W. W., K. Daum, C. J. Imig, C. Martin and R. Kisgen: Effects of breakfasts of different size and content on physiologic response of men. *J. Amer. diet. Ass., 27:* 190-196, 1951. Abstr: *B. A., 26:* No. 24449, 1952.

7925. Tuttle, W. W., K. Daum and B. Randall: Effect of altered breakfast habits on physiologic responses of men past 60 years of age. *Fed. Proc., Baltimore, 11:* 164, 1952. Abstr: *B. A., 26:* No. 28235, 1952.

7926. Young, C. M., and H. L. Pilcher: Nutritional status survey, Groton Township, New York. II. Nutrient usage of families and individuals. *J. Amer. diet. Ass., 26:* 776-781, 1950.

7927. Zeman, F. D.: Fundamental considerations,

old and new, in nutrition of the elderly. *Fed. Proc., Baltimore, 11:* 794-797, 1952.

See also Nos. 7940, 7997, 8257.

VII. Parental Age

7928. Brower, O. E.: *Should fatherhood begin at forty?* The Author, Phila., 1952, xvi, 240 pp.

7929. Lowe, C. R., and R. G. Record: Risk of stillbirth in twin pregnancy related to sex and maternal age; an analysis of 90,386 twin maternities. *Brit. J. soc. Med., 5:* 34-40, 1951. Abstr: *P. I., 18:* No. 1384, 1952.

7930. McKeown, T., B. MacMahon, and R. G. Record: The incidence of congenital pyloric stenosis related to birth rank and maternal age. *Ann. Eugen. Camb., 16:* 249-259, 1951. Abstr: *B. A., 26:* No. 17161, 1952.

ORGAN SYSTEMS

I. Blood

7931. Cali, G.: Rilievi sul numero dei leucociti e sulla formula leucocitaria nell'adulto normale sicilian. *G. Clin. med., 32:* 1111-1122, 1951.

7932. Essellier, A. F., and K. F. Wagner: Bestimmung der Lebensdauer der eosinophilen Granulocyten. *Schweiz. med. Wschr., 82:* 526-528, 1952.

7933. Reigt, L. G., and C. L. Regalado: Frequenza dell'anemia perniciosa nella vecchiaia. *Riv. Geront. Geriat., 1:* 212, 1951.

See also Nos. 7937, 8028.

I-A. Blood: *Chemistry*

7934. Ingegnieros, S., and P. Gallucci: Indagine sul comportamento degli indici disprotidemici. *Longevitá, 1:* 21-24, May-June 1952.

7935. Pederzini, A., and R. Ghisellini: Sul significato semeiotico del gerontoxon e sui rapporti con lo stato iperlipidemico. *Rass. Fisiopat., clin. terap., 23:* 341-346, 1951.

7936. Pirrie, R.: The influence of age upon serum iron in normal subjects. *J. clin. Path., 5:* 1-9, 1952.

7937. Renbourn, E. T., and J. McK. Ellison: Some blood changes in old age; a clinical and statistical study; hematocrit, erythrocyte sedimentation rate, erythrocyte fragility; white cell count; blood urea, chloride, cholesterol; blood pressure and urine changes. *Hum. Biol., 24:* (2), 57-86, 1952. Abstr: *B. A., 26:* No. 28234, 1952.

7938. Ricketts, H. T.: Serum lipids in atherosclerosis. *Proc. Inst. Med. Chicago, 19:* 105, 1952.

7939. Sergio, T.: Studio della viscosità del siero in soggetti con vasculopatia aterosclerotica o portatori di gerontoxon. *Riv. Geront. Geriat., 1:* 128, 1951.

7940. Williams, H. H., J. S. Parker, Z. H. Pierce, J. C. Hart, G. Fiala, and H. L. Pilcher: Nutritional status survey, Groton Township, New York. VI. Chemical fiindings. *J. Amer. diet. Ass., 27:* 215-221, 1951.

I-B. Blood: *Coagulation*

7941. Bazan, J., and C. Schiavo: Flebotrombosis y tromboflebitis; aspecto clínico. *Sem. méd., B. Aires, 100:* 159-180, 1952.

7942. Beaumont, J. L., A. Gerbaux, and J. Ienegre: Les thromboses veineuses et leur traitement anticoagulant; suivi par le test de la tolérance à l'héparine in vitro. *Pr. méd., 59:* 1665-1670, 1951.

7943. Grüning, W.: Ein Beitrag zur Praxis der Thromboseprophylaxe. *Dtsch. med. Wschr., 76:* 1306-1307, 1951.

7944. Mondor, H., and I. Bertrand: Thrombophlébites et périphlébites de la paroi thoracique antérieure. *Pr. méd., 59:* 1533-1535, 1951.

7945. Naide, M.: Spontaneous venous thrombosis in the legs of tall men. *J. Amer. med. Ass., 148:* 1202-1203, 1952.

See also No. 7955.

III. Cardiovascular System

(blood vessels, blood pressure, hypertension, blood volume, veins, and arteriosclerosis)

7946. Altschul, R.: The cellular pattern of the vessel wall. *Geriatrics, 7:* 270-273, 1952.

7947. Banga, I., and A. Nowotny: (Change of the ATP-ase activity and elastin content of the arterial wall in consequence of arteriosclerosis.) *Acta physiol. hung., 2:* 327-331, 1951.

7948. Bolt, W., and M. F. Bell: Calcification of the thoracic aorta; a mortality study. *Trans. Ass. Life Insur. med. Dir., 35:* 135-148, 1951.

7949. Bragdon, J. H.: Spontaneous atherosclerosis in the rabbit. *Circulation, 5:* 641-646, 1952.

7950. Curwen, I. H. M., and B. O. Scott: The ambulant treatment of complications resulting from varicose veins and allied conditions. *Ann. phys. Med., 1:* 17-25, 1952.

7951. D'Errico, G., and C. Sabbatini: La pressione venosa nelle varici degli arti inferiori. *G. ital. Chir., 7:* 649-654, 1951.

7952. Donadi, G. C.: Considerazioni statistiche e pratiche di cura radicale delle affezioni varicose e flebitiche. *Gaz. med. ital., 111:* 14-18, 1952.

7953. Etheridge, E. M., and C. Hochligeti: Lipid

deposition in aortas in younger age groups following cortisone and adrenocorticotrophic hormone. *Amer. J. Path., 28:* 315-319, 1952. Abstr: *B. A., 26:* No. 20921, 1952.

7954. Fontaine, R., C. Kayser, and R. Riveaux: Contribution à la pathogénie des scléroses cutanées et des ulcères de jambe d'origine postphlébitique et variqueuse; conception personnelle et déductions thérapeutiques. *Rev. Chir. Paris, 70:* 357-377, 1951.

7955. Gipperich, L. and S. Lo Bianco: Sul comportamento della velocità di circolo e di sedimentazione, del tempo di coagulazione e di emorragia e della fragilità capillare nella vecchiaia. *G. Clin. med., 32:* 1081-1110, 1951.

7956. Gofman, J. W.: Diet and lipotrophic agents in atherosclerosis. *Bull. N. Y. Acad. Med., 28:* 279-293, 1952.

7957. Henschel, A., and A. Keys: Size of retinal arterioles as related to age and blood pressure. *Fed. Proc., Baltimore, 11:* 68, 1952. Abstr: *B. A., 26:* No. 21289, 1952.

7958. Lansing, A. I.: The role of elastic tissue in the formation of the arteriosclerotic lesion. *Ann. intern. Med., 36:* 39-49, 1952. Abstr: *B. A., 26:* No. 21314, 1952.

7959. Leonhardt, H.: Über die Behandlung ausgedehnter Krampfaderbildungen mit Ligatur der V. saphena und Varicocid-Injektion durch distal eingeführten Ureterenkatheter. *Ärtzl. Wschr., 7:* 56-58, 1952.

7960. Luger, A.: Kapillarbefunde bei varikosem Symptomenkomplex. *Z. Haut. & Geschlkr., 11:* 459-465, 1951.

7961. Miller, H., H. Haft, and D. M. Kraemer: Carbohydrate content of the human aortic albuminoid. *Proc. Soc. exp. Biol., N. Y., 79:* 411-414, 1952. Abstr: *B. A., 26:* No. 21350, 1952.

7962. Nordmann, M.: Die Grundlagen der Arteriosklerose nach allgemeinpathologischen Gesichtspunkten. *Z. Altersforsch., 6:* 214-230, 1952.

7963. Polichetti, E.: Il metodo italiano nella cura delle varici. *G. Chir. ital., 5:* 533-540, 1951.

7964. Reiser, M. F., A. A. Brust, A. P. Shapiro, H. M. Baker, W. Ranschoff, E. B. Ferris: Life situations, emotions and the course of patients with arterial hypertension. *Res. Publ. Ass. nerv. ment. Dis., 29:* 870-880, 1950. Abstr: *P. A., 26:* No. 5007, 1952.

7965. Talmage, C. H.: Thrombophlebitis and phlebothrombosis. *Ann. west. Med. Surg., 6:* 238-243, 1952.

7966. Ungerleider, H. E. (Editor): Abstracts from symposium on the experimental and clinical aspects of lipid metabolism, arteriosclerosis and the aging process. *Geriatrics, 7:* 246-249, 1952.

7967. Vulterini, S., A. Vergati, and G. Costantini: L'ipercolesterolemia come fattore di vasculopatia aterosclerotica e di gerontoxon. *Policlinico, Sez. prat., 58:* 1565-1573, 1951.

See also Nos. 7938, 8030, 8061.

III-G. Cardiovascular System: *Heart*

(heart, anatomy and physiology, heart disease, coronary artery disease, and myocardial disease)

7968. Baker, B. M., Jr., W. R. Scarborough, M. L. Singewald, R. E. Mason, and F. W. Davis, Jr.: Ballistocardiography in patients with coronary artery disease and in apparently normal persons. (Abstract.) *Geriatrics, 7:* 246, 1952.

7969. Conn, J. J., R. W. Kissane, R. A. Koons, and T. E. Clark: The treatment of angina pectoris with khellin. *Ann. intern. Med., 36:* 1173-1178, 1952.

7970. Gelato, D.: Asse elettrico nell'età senile. *Acta gerontologica, 2:* 10-32, Jan.-Feb. 1952.

7971. Glaser, R. J., G. J. Dammin and W. B. Wood, Jr.: Effects of repeated streptococcal pulmonary infections on the cardiovascular system in rats. *Arch. Path., Chicago, 52:* 253-259, 1951.

7972. Hernandez Aguilar, E. and J. T. Fernández Echazabal: Estudio electrocardiográfico en 100 personas mayores de 65 años de edad. *Arch. Hosp. univ. García, Habana, 3:* 495-504, 1951.

7973. Jallut, H.: Traitement de l'angina de poitrine. *Clinique, Paris, 47:* 115-123, 1952.

7974. Kirkland, H. B., C. E. Kiessling, and A .M. Lyle: The evaluation of certain fundamental electrocardiographic patterns in the selection of insurance risks. *Trans. Ass. Life Insur. med. Dir., 35:* 86-134, 1951.

7975. Kleiber, E. E.: Parenteral administration of ammivin (khellin) in the treatment of coronary disease. *Ann. intern. Med., 36:* 1179-1189, 1952.

7976. Morris, J. N., J. A. Heady, and R. G. Barley: Coronary heart disease in medical practitioners. *Brit. med. J., 1952:* (4757), 503-520, 1952. Abstr: *B. A., 26:* No. 21354, 1952.

7977. Morrison, L. M.: The serum phospholipid-cholesterol ratio as a test for coronary atherosclerosis. *J. Lab. clin. Med., 39:* (4), 550-555, 1952. Abstr: *B. A., 26:* No. 28126, 1952.

7978. Schwartz, B., and B. Berman: Incidence of heart disease in mass x-ray surveys. *J. Amer. med. Ass., 149:* 734-735, 1952. Abstr: *B. A., 26:* No. 24764, 1952.

7979. Scott, R. C., and V. J. Seiwert: The treatment of angina pectoris with pure crystalline khellin. *Ann. intern. Med., 36:* 1190-1197, 1952.

7980. Storstein, O., S. Humerfelt, O. Muller, and H. Rasmussen: Patent ductus arteriosus in a

woman aged 72 years. *Brit. Heart J., 14:* 276-278, 1952.

7981. von Wedel, J., P. W. Stone, C. G. Newman, J. W. Lord, Jr., J. W. Hinton, and R. E. Moran: Revascularization of the heart by a pedicle skin flap. *Science, 116:* (3013), 319-320, 1952.

7982. White, P. D.: Heart disease forty years ago and now. *J. Amer. med. Ass., 149:* 799-801, 1952.

7983. Zeman, F. D., and S. Storch: Syphilitic heart disease in the aged. *Ann. intern. Med., 36:* 1423-1436, 1952.

See also No. 8063.

IV. Connective Tissue and Cartilage

7984. Hegemann, G., and R. Leutschaft: Röntgenspektrographische Untersuchungen über Kollagenstrukturen bei der Wundheilung. *Klin. Wschr., 29:* 665-668, 1951.

7985. Mirouze, J., and A. Crastes De Paulet: La gentisurie provoque; methode possible d'exploration du collagene. *Pr. méd., 59:* (75), 1567-1569, 1951. Abstr: *B. A., 26:* No. 28248, 1952.

7986. Ragan, C. (Editor): *Connective tissues; transactions of the 2nd conference, May 24-25, 1951.* Josiah Macy, Jr. Found., New York, 1952, 190 pp.

7987. Scarzella, R., and G. Mars: Alterazioni mesenchiamali nella vecchiaia. *Riv. Geront. Geriat., 7:* 211-223, 1951.

7988. Wheeler, C. E., A. C. Curtis, E. P. Cawley, R. H. Grekin, and B. Zheutlin: Soft tissue calcification, with special reference to its occurrence in the "collagen diseases". *Ann. intern. Med., 36:* 1050-1075, 1952.

V. Endocrine System
(includes sex glands and climacteric)

7989. Alberto, G.: Metrorragia postmenopáusica no blastomatosa. *Obstet. gin. lat.-amer., 9:* 381-410, 1951.

7990. Blanco Soler, C.: Diabetes de los viejos. *Rev. clín. esp., 44:* 1-8, 1952.

7991. Bychowski, G.: Schizophrenia in the period of involution. *Dis. nerv. Syst., 13:* 150-153, 1952.

7992. Czech, H.: Über die Behandlung der klimakterischen Blutungen mit den Betastrahlen des Radiums. *Geburt. Frauenheilk., 11:* 867-877, 1951.

7993. Dana, E. S.: Management of menopause. *Med. Times, N. Y., 80:* 221-227, 1952.

7994. Deloch, K.: Zur Behandlung des Klimakterium virile. *Med. Klinik., 47:* 189-190, 1952.

7995. Dillon, E. S., and J. M. Trapnell, Jr.: Overweight as a contributing factor in the development of diabetes and its complications. *Trans. Ass. Life Insur. med. Dir., 35:* 280-290, 1951.

7996. Garcia, J. A.: Psychoses climatériques et involutionnelles. *Mschr. Psychiat., Basel, 122:* 332-348, 1951.

7997. Gozan, H. A.: The use of vitamin E in treatment of the menopause. *N. Y. St. J. Med., 52:* 1289-1291, 1952.

7998. Greenblatt, R. B.: Newer concepts in management of the menopause. *Geriatrics, 7:* 263-269, 1952.

7999. Grodzicki, W. D., W. Birkmayer, and E. Preissecker: Zur Elektrokrampfbehandlung vegetativer Krisen im Klimakterium. *Med. Klinik., 47:* 85, 1952.

8000. Korenchevsky, V.: *Endocrines and aging.* In: T. C. Desmond (chairman), Age Is No Barrier. N. Y. State Joint Legis. Commit. on Probl. of Aging, Legis. Doc. No. 35, 1952, pp. 120-128.

8001. Kuhl, W. J., Jr., H. Wilson, and E. P. Ralli: Measurements of adrenal cortical activity in young men subjected to acute stress. *J. clin. Endocrinol. & Metab., 12:* 393-406, 1952.

8002. Mancini, R., F. Nolasco, and F. A. de la Balze: Estudio histoquímico sobre el testículo humano adulto normal. *Rev. méd. Córdoba, 40:* 61-62, 1952.

8003. Perkins, R. F., and E. H. Rynearson: Practical aspects of insufficiency of the anterior pituitary gland in the adult. *J. clin. Endocrinol. & Metab., 12:* 574-603, 1952.

8004. Prieto, G., and A. Cascos: Un caso de *keratoderma climatericum. Actas derm. sif., Madr., 43:* 254-255, 1951.

8005. Quadras-Bordes, L., and V. Quadras-Bordes: Notre expérience des hémorragies fonctionnelles de la pré-ménopause. *C.R. Soc. franç. gyn., Paris, 21:* 366-369, 1951.

8006. Root, H. F.: Degenerative complications of diabetes; a review. *J. clin. Endocrinol. & Metab., 12:* 458-479, 1952.

8007. Ruzicska, G., and I. Berta: (Endometrial findings in postmenopausal hemorrhages.) *Mag. nöorv. lap., 15:* 4-11, 1952.

8008. Salinger, S.: Le frottis vaginal chez le femme en ménopause. *Gynéc. et Obstét., 50:* 492-495, 1951.

8009. Schteingart, M., and E. Rosembitt: Aspectos endocrinos en la edad del climatério masculino en enfermos mentales. *Rev. méd. Córdoba, 40:* 60-61, 1952.

8010. Schwartz, E. D., and J. I. Goodman: Group therapy of obesity in elderly diabetics. *Geriatrics, 7:* 280-283, 1952.

8011. Sheridan, J. T., and J. M. Peck: Overweight as a contributing factor in the development of diabetes and its complications. *Trans. Ass. Life Insur. med. Dir., 35:* 291-300, 1951.

8012. Solez, C.: Aging and adrenal cortical hormones. *Geriatrics, 7:* 241-245, 1952.

8013. Solez, C.: Aging and adrenal cortical hormones. Part II. *Geriatrics, 7:* 290-294, 1952.

8014. Stoll, K. L.: Behandlung des Altersdiabetes mit Geschlechtshormonen. *Münch. med. Wschr., 94:* 70-71, 1952.

8015. Tesuaro, G.: La sénescence de l'hypophyse. *Gynec. prat., Paris, 2:* 469-470, 1951.

8016. Trucco, E., M. Gambin, J. D. Cirio, and E. B. del Castillo: El hipertiroidismo en la vejez. *Rev. méd. Córdoba, 40:* 60, 1952.

8017. Zajaczkowski, H.: (Nervosism and psychism in puberty and climacteric.) *Neurol. polska, Warsaw, 1:* 234-240, 1951.

See also Nos. 8130, 8177, 8199.

VI. Gastro-Intestinal System

8018. Alessandrini, P.: Le forme cliniche delle epatopatie senili. *Progr. med. Napoli, 8:* 48-55, Jan. 1952.

8019. Carp, L., and J. A. Arminio: Acute appendicitis in chronically ill geriatric patients. *Amer. J. Surg., 83:* 773-780, 1952.

8020. Casal, M. A., and V. D'Alotto: Estenosis crónica del intestino grueso. *Prensa méd. argent., 39:* 583-594, 1952.

8021. Devin, M.: Les indications particulières des differentes méthodes de prise d'empreinte pour édentés totaux. *Rev. Odontol., Paris, 73:* 564-572, 1951.

8022. Dodson, M. H.: The efficacy of various solutions used in the injection treatment of internal hemorrhoids. *J. med. Ass. Alabama, 21:* 227-230, 1952.

8023. Dubarry, J. J., and J. Riviere: Essai de traitement par la cortisone et la testostérone d'une cirrhose de la ménopause avec hépatomégalie et ictère et effondrement des 11 et des 17 stéroides urinaires. *Rev. internat. Hépatol.,* No. 4, 105-111, 1951.

8024. Horn, O.: (Treatment of hemorrhoids.) *Ugesk. Laeg., 113:* 1636, 1951.

8025. Magazanik, G. L.: (Physio-therapeutic methods in prevention and therapy of hemorrhoids.) *Med. Sestra, Moskva,* No. 2, 6-8, Feb. 1952.

8026. Piccinno, A.: Spodografia dell'appendice umana dal periodo fetale a quello senile. *Rass. med. sarda, 53:* 225-228, 1951.

8027. Plotegher, A.: L'appendicite nell'età senile. *Riv. Geront. Geriat., 2:* 93-99, 1952.

8028. Röttjer, E. A., and M. C. Lascalea: Anemia grave y hernia del hiato diafragmático en el viejo. *Prensa méd. argent., 39:* 283-287, 1952.

8029. Rossi, A.: La metilcellulosa sintetica nel trattamento della stipsi cronica. *Minerva med., Torino, 43:* 154-155, 1952.

See also No. 7911.

IX. Muscular System

8030. Banga, I., and A. Nowotny: (Comparative studies about adenosinetriphosphatase activity of human muscles, aorta and arteria femoralis.) (Abstract.) *Acta physiol. hung., 2:* 317-325, 1951. Abstr: *B. A., 26:* No. 28053, 1952.

8031. Bookwalter, K. W., B. Bruce, C. Cameron, G. I. Fox, V. L. Hoffman, P. Newquist, D. Rains, and M. Rousey: Grip strength norms for males. *Res. Quart. Amer. Ass. Hlth., 21:* 249-273, 1950. Abstr: *P. A., 25:* No. 5049, 1951.

8032. Hiner, R. L., and O. G. Hankins: Effect of freezing on tenderness of beef from different muscles and from animals of different ages. *Food Technol., 5:* 374-376, 1951. Abstr: *B. A., 26:* No. 584, 1952.

8033. Ingelmark, B. E.: Die normalen Altersveränderungen der Extremitätenmuskulatur unter verschiedenen funktionellen Bedingungen. *Anat. Anz., 97:* (Suppl.), 83-89, 1951.

X. Nervous System (neurology)

8034. Barrett, E.: Parkinsonian tremor, manic depressive psychosis and servomechanisms. *Amer. J. med. Sci., 220:* 485, 1950. Abstr: *B. A., 26:* No. 18310, 1952.

8035. Baudouin, A., and J. Lereboullet: Le traitement de la maladie de Parkinson. *Rev. prat., Paris, 2:* 176-179, 1952.

8036. Bearzy, H. J.: The rehabilitation of the hemiplegic. *Ohio St. med. J., 48:* 409-414, 1952.

8037. Bessman, A. N., R. W. Alman, and J. F. Fazekas: Effect of acute hypotension on cerebral hemodynamics and metabolism of elderly patients. *Arch. intern. Med., 89:* 893-898, 1952.

8038. Brzustowicz, R. J., and J. W. Kernohan: Cell rests in the region of the fourth ventricle. I. Their site and incidence according to age and sex. *Arch. Neurol. Psychiat., Chicago, 67:* 585-591, 1952.

8039. Doshay, L. J., K. Constable, and S. Fromer: Preliminary study of a new anti-Parkinson agent. *Neurology, 2:* 233-243, 1952. Abstr: *B. A., 26:* No. 21487, 1952.

8040. Haglund, G.: (Curare therapy of Parkinson-

ism). *Svenska Läkartidn., 48:* (51), 3056-3062, Dec. 1951.

8041. Haguenau, J.: Conduite à tenir en présence d'une apoplexie. *Pr. méd., 60:* 397-398, 1952.

8042. Hermann, H.: Zusammenfassende Ergebnisse über Altersveränderungen am peripheren Nervensystem. *Z. Altersforsch., 6:* 197-213, 1952.

8043. Kirgis, H. D., and R. C. Llewellyn: The diagnosis and treatment of cerebrovascular accidents. *Bull. Tulane med. Fac., 11:* 136-143, May 1952.

8044. Leriche, R.: Treatment of embolism and thrombosis of the cerebral vessels. *Brit. med. J., 1:* (4752), 231-235, 1952.

8045. Leroy, A.: Hémiplégie organique améliorée par le traitement convulsivant. *Rev. méd. Liège, 7:* 89-90, 1952.

8046. Leroy, R.: L'hémiplégie due à un accident circulatoire cérébral est-elle une contreindication à la convulsivothérapie? Forte amélioration d'une hémiplégie organique après le traitement convulsivant. *Rev. méd. Liège, 7:* 85-89, 1952.

8047. Riese, M. W.: Les tumeurs cérébrales en fonction de l'âge; deuxième communication; les tumeurs cérébrales dans le vieillesse. *Rev. neurol., 85:* 400-401, 1951.

8048. Scheinberg, P., and H. W. Jayne: Factors influencing cerebral blood flow and metabolism; a review. *Circulation, 5:* 225-236, 1952. Abstr: *B. A., 26:* No. 15138, 1952.

8049. Shev, E. E., and J. E. Giansiracusa: The effect of ACTH in severe, recurrent chorea. *Calif. Medicine, 76:* 298-299, 1952.

8050. Simon, A., J. W. Gofman, N. Malamud, H. B. Jones and F. T. Lindgren: Lipoproteins in general and cerebral arteriosclerosis. *Amer. J. Psychiat., 108:* 663-668, 1952.

8051. Terzuolo, C.: Ricerche sul ganglio ciliare degli uccelli; connessioni, mutamenti in relazione all'età e dope recisione delle fibre prepangliari. *Z. Zellforsch., 36:* 255-267, 1951.

8052. Thiry, S.: A propos de quelques observations de thrombo-phlébite cérébrale. *Rev. méd. Liège, 7:* 94-95, Feb. 1952.

8053. Torres, A. M.: Moderno conceito patogenico de hemorragia cerebral. *Resenha clín. cient., S. Paulo, 20:* 291-295, 1951.

8054. Venerando, A.: Terapia del morbo di Parkinson. *Progr. med., Napoli, 8:* 121-122, 1952.

See also No. 8265.

XI. Reactions of the Body as a Whole

(allergy, anoxia, anesthesia, anthropometry, drugs, exercise, immunity, sleep, and temperature regulation)

8055. Arnold, A.: Sport und Alter. *Z. Altersforsch., 6:* 258-266, 1952.

8056. Bory, R., and N. Pardon: Contribution a l'évaluation du facteur alimentaire dans l'obésité. *Pr. méd., 60:* 333-334, March 1952.

8057. Brožek, J.: Changes of body composition in man during maturity and their nutritional implications. *Fed. Proc., Baltimore, 11:* 784-793, 1952.

8058. Büchi, E. C.: Änderungen der Körperform beim erwachsenen Menschen. *Anthrop. Forsch., 1:* 1-44, 1950.

8059. Carnera, G.: Osservazioni sull'uso del siero di Bogomoletz. *Rif. med., 66:* 207-212, 1952.

8060. Dublin, L. I., and H. H. Marks: Mortality among insured overweights in recent years. *Trans. Ass. Life Insur. med. Dir., 35:* 235-266, 1951.

8061. Durant, T. M.: Insurance hazards of overweight; dietary factors in the development of atherosclerosis. *Trans. Ass. Life Insur. med. Dir., 35:* 267-279, 1951.

8062. Edsall, G.: The immunization of adults against diphtheria and tetanus. *Amer. J. publ. Hlth., 42:* 393-400, 1952. Abstr: *B. A., 26:* No. 21840, 1952.

8063. Heyer, H. E.: The lifetime weight curve and coronary artery disease. *Sth. med. J., Birmingham, 45:* 428-435, 1952.

8064. Kretschmer, E.: Methodisches zur Konstitutionsstatistik. *Z. menschl. Vereb. KonstLehre., 30:* 350-363, 1951. Abstr: *B. A., 26:* No. 23595, 1952.

8065. Lacorte, J. G., and J. C. Loures: Sôbre a virulência do virus West Nile em relaçao a idade dos animals sensiveis. *Hospital, Rio de J., 40:* 567-570, 1951.

8066. Luongo, E. P.: The overweight executive; problems and programs. *Med. Ann. District of Columbia, 21:* 253-255, 1952.

8067. Newman, R. W.: Age changes in body build. *Amer. J. phys. Anthrop., 10:* 75-90, March 1952.

8068. Parada, J., H. Cabo, and F. Molina: La anestesia general en geriatría. *Rev. méd. Córdoba, 40:* 53, 1952.

8069. Pfeiffer, K., and G. Steudtner: Über das Vorkommen von Kälteagglutininen in verschiedenen Lebensaltern. *Z. Altersforsch., 6:* 231-233, 1952.

8070. Anonymous: Experienca de cinco años con el suero citotóxico antoi-reticular. *Prensa méd. argent., 39:* 461-464, 1952.

See also Nos. 7841, 7995, 8011.

XII. Reproductive System

(ovaries, testis see Endocrine System)

8071. Ahumada, J. C., and L. A. Arrighi: Traitement

du prolapsus genital. *C.R. Sof. franç. gyn., Paris, 22:* 63-65, 1952.

8072. Barnes, J.: L'hystérectomie vaginale dans le traitement du prolapsus. *C.R. Soc. franç. gyn., Paris, 22:* 43-45, 1952.

8073. Dhom, G.: Histologische Kürettagebefunde bei Frauen über 50 Jahre. *Dtsch. med. Wschr., 77:* 77-80, 1952.

8074. Erickson, C., W. L. Williams, Jr., and K. Paullus: Pathological changes in vagina and cervix of mice with advancing age and under influence of injections of alpha estradiol-sensitized collodion particles. (Abstract.) *Fed. Proc., Baltimore, 11:* 413-414, 1952. Abstr: *B. A., 26:* No. 27922, 1952.

8075. Ewer, J. N.: Senile vaginitis. *West J. Surg., 60:* 230-235, 1952.

8076. Newell, J. W., and J. Rock: Upper age limit of parturition; a review of the literature. *Amer. J. Obstet. Gynec., 63:* 875-876, 1952.

8077. Nokes, J. M., W. N. Thorton, Jr., and T. C. King, Jr.: A critical analysis of the young and elderly primiparas. *Sth. med. J., Birmingham, 45:* 866-869, 1952.

8078. Terzano, G.: Citologia vaginal en la mujer de edad avanzada. *Rev. méd. Córdoba, 40:* 57, 1952.

XIII. Respiratory System

8079. Adam, A.: Erfahrungen mit der elektrischen Lunge bei der Asthma-und Emphysembehandlung. *Prakt. Arzt., 5:* 1455, 1951.

8080. Bariola, C., and A. Bergamini: Considerazioni su di un caso di neoplasia pleuropolmonare in età senile. *Acta gerontologica, 2:* 3-9, 1952.

8081. Bates, D. V.: The uptake of carbon monoxide in health and in emphysema. *Clin. Sci., 11:* 21-32, 1952. Abstr: *B. A., 26:* No. 17806, 1952.

8082. Brun, J., J. Viallier, P. Buffard, R. Lehmann, H. Kalb, and —. Anjou: L'emphysème bronchectasique et étude radiologique de l'emphysème bulleux chronique et passager. *Lyon méd., 186:* 105-108, 1952.

8083. Cohn, J. E.: Changes in maximum diffusing capacity of lungs with age. (Abstract.) *Fed. Proc., Baltimore, 11:* 26, 1952. Abstr: *B. A., 26:* No. 27658, 1952.

8084. Comstock, G. W.: Tuberculosis studies in Muscogee County, Georgia. I. Community-wide tuberculosis research. *Publ. Hlth. Rep., Wash., 64:* (9), 259-290, 1949. Abstr: *P. I., 15:* No. 1251, 1949.

8085. Dublin, L. I.: *A 40 year campaign against tuberculosis.* Metrop. Life Insur. Co., N. Y., 1952, 115 pp.

8086. Duncan-Weatherley, A. H.: The ventilatory response to low concentrations of carbon dioxide in normal young men. *Aust. J. exp. Biol., med. Sci., 30:* 95-104, 1952.

8087. Ferris, B. G., Jr., J. L. Whittenberger, and J. R. Gallagher: Maximum breathing capacity and vital capacity of male children and adolescents. *Pediatrics, 9:* 659-670, 1952.

8088. Fongi, E. G.: Enfisema espontáneo del mediastino; estudio de conjunto. *Prensa méd. argent., 38:* 3203-3214, 1951.

8089. Fowler, W. S., E. R. Cornish, Jr., and S. S. Kety: Lung function studies. VIII. Analysis of alveolar ventilation by pulmonary N_2 clearance curves. *J. clin. Invest., 31:* 40-50, 1952.

8090. Gasteva, Z. A.: (Study on function of the respiratory apparatus in chronic pulmonary emphysema.) *Klin. Med., Mosk., 30:* 86-87, 1952.

8091. Herman, S. G., A. V. Soboleva, I. M. Velikson, and V. B. Makhlina: (Clinico-functional method of determination of the state of respiratory insufficiency in chronic non-tuberculous pulmonary disease.) *Klin. Med., Mosk., 30:* 87, 1952.

8092. Krentz, K.: Beitrag zur Behandlung von Bronchitiden und anderen Krankheiten der Luftwege. *Med. Welt., 20:* 1321-1322, 1951.

8093. Lamache, A., P. Delalande, H. Davost, and R. Guerin: Emphysème, dystrophie de tissu conjonctif et hypophyse. *Bull. Acad. Méd., Paris, 136:* 44-46, Jan. 1952.

8094. Motley, H. L.: Clinical pulmonary physiology. I. Evaluation of function impairment and new developments in therapy of chronic pulmonary disease. *Arch. industr. Hyg. & occup. Med., 5:* 554-565, 1952.

8095. Prior, J. A.: Chronic bronchitis and acute bronchiolitis in adults. *Ohio St. med. J., 48:* 310-314, 1952.

8096. Raposo de Almeida, T. R.: Prevalencia da tuberculose. *Rev. brasil. Estatist., 9:* 20-32, 1948. Abstr: *P. I., 15:* No. 733, 1949.

8097. Schaffer, K.: Die Aerosolbehandlung der chronischen Bronchitis und des Asthma bronchiale mit Myocain E. *Wien. med. Wschr., 101:* 886, 1951.

8098. Testori, E.: Il calibro bronchiale nella vecchiaia. *Riv. Geront. Geriat., 2:* 102-108, 1952.

8099. Tucker, D., J. E. Coulter, and J. Downes: Incidence of acute respiratory illness among males and females at specific ages. *Milbank mem. Fd. quart. Bull., 30:* 42-60, 1952. Abstr: *B. A., 26:* No. 22025, 1952.

8100. Vallesi, R. N.: Gli elementi mucosi dell'epitelio e le ghiandole della trachea nelle varie età della vita. *Arch. ital. Anat. Embriol., 56:* 231-246, 1951.

8101. Anonymous: Mortalidad por tuberculosis en

la Argentina años 1911 a 1948. *Hoja Tisiol., 11:* 360-363, 1951.

See also Nos. 7853, 8254.

XIV. Sense Organs and Perception

8102. Boase, A. J.: Glaucoma. *E. Afr. med. J., 29:* 45-52, 1952.

8103. Crouch, E. L.: The relation between illumination and vision. *Illum. Engn., 40:* 747-784, 1945.

8104. De Gaspare, P. F. F.: Sul comportamento della macchia cieca e degli angioscotomi nei tests di provocazione del glaucoma cronico come criterio diagnostico addizionale. *Boll. Oculist., 30:* 677-702, 1951.

8105. Frey, G.: Eye problems of aging. *Bol. Asoc. méd. P. Rico, 44:* 77-81, 1952.

8106. Gailey, W.: Do's and don'ts of cataract surgery. *J. int. Coll. Surgeons, 17:* 208-212, 1952.

8107. Galli, L. A.: La hipoacusia de la edad y el uso de otoamplífonos. *Rev. méd. Córdoba, 40:* 59-60, 1952.

8108. Garzino, A.: Istologia del sacco lacrimale nel vecchio. *Acta gerontologica, 2:* 33-36, Jan.-Feb. 1952.

8109. Hartleib, R., and H. F. Piper: In welchem Alter soll das Schielen operiert werden? *Med. Klinik., 47:* 124, 1952.

8110. Karpe, G. and B. Vainio-Mattila: The clinical electroretinogram. III. The electroretinogram in cataract. *Acta ophthal., Kbh., 29:* 113-128, 1951.

8111. Kleemeier, R. W.: The relationship between ortho-rater tests of acuity and color vision in a senescent group. *J. appl. Psychol., 36:* 114-116, 1952.

8112. Lederer, F. L., and R. E. Marcus: The adult and his hearing problem. *Ann. Otol., etc., St. Louis, 61:* 126-143, 1952.

8113. Poliak, B. L., and V. V. Volkov: (New Soviet miotic preparation benzamon and its therapeutic significance in glaucoma.) *Věstn. Oftal., 31:* 18-21, 1952.

8114. Prijot, E., and R. Weekers: Mesure de la résistance à l'écoulement de l'humeur aqueuse au moyen du tonomètre électronique. *Ophthalmologica, 123:* 1-15, 1952.

8115. Sharapov, I. M.: (New miotic and anti-glaucomatous preparation of phosphacol.) *Věstn. Oftal., 31:* 21-23, 1952.

8116. Tikhomirov, P. E., and N. N. Dmitrieva: (Effect of di-isopropyl fluorophosphate on intraocular pressure in glaucoma.) *Věstn. Oftal., 31:* 27-31, 1952.

8117. Weekers, R., and E. Prijot: Mesure de la résistance à l'écoulement de l'humeur aqueuse au moyen tonomètre électronique. 2e partie. Résultats chez les sujets atteints de glaucome chronique non inflammatoire. *Ophthalmologica, 123:* 114-122, 1952.

8118. Zaverukha, F. M.: (Nicotinic acid in glaucoma.) *Věstn. Oftal., 31:* 31-35, 1952.

See also No. 7957.

XV. Skeletal System

8119. Coste, F., and L. Auquier, and J. Civatte: Polyarthrite chronique évolutive avec luxation atloïdoaxoïdienne sans signes de compression médullaire. *Rev. Rhumat., Paris, 19:* 55-56, 1952.

8120. Ravault, P. P., and G. Vignon: Etude clinique et thérapeutique des arthroses et discopathies de la colonne cervicale. *Rhumatologie,* No. 1, 1-39, 1952.

XV-A. Skeletal System: *Bone*

8121. Bek, V.: Senile begrenzte konzentrische Osteoatrophie der Schädeldecke. *Čas. Lék. čes., 8:* 242, 1952.

8122. Burman, M.: Frontal plane intertrochanteric fracture; a case report. *Geriatrics, 7:* 288, 1952.

8123. Demartini, F., A. W. Grokoest, and C. Ragan: Pathological fractures in patients with rheumatoid arthritis treated with cortisone. (Abstract.) *J. Amer. med. Ass., 149:* (8), 750-752, 1952. Abstr: *B. A., 26:* No. 27774, 1952.

8124. Kovacevic, B.: Fracture du col du fémur chez un homme age de 114 ans, güeri par la methode operatoire de Smith-Petersen. *J. int. Chir., Brux., 12:* 48-49, 1952.

8125. Lacroix, P., R. Devis, and E. Schicks: Distribution of radiophosphorus in the long bones of adult rabbits. *Experientia, 8:* 113-114, 1952. Abstr: *B. A., 26:* No. 20531, 1952.

8126. Lichtwitz, A.: Diagnostic des ostéopathies chroniques généralisées. *Sem. méd., Paris, 27:* 839-845, 1951.

8127. Metcalfe, R. H.: Fractures in the aged. *Brit. med. J., 1:* (4770), 1240-1242, 1952.

8128. Neuman, W. F., and B. J. Mulryan: *The effect of age on recrystallization of bone mineral.* Univ. of Rochester, Atomic Energy Project, Contract W-7401-eng-49-Ur-193, March 1952, pp. 1-10.

8129. Perroy, —.: Les ostéoporoses séniles. *J. belge Radiol., 35:* 216-220, 1952.

8130. Polishuk, Z., and E. M. Kleinhause: Treatment of post-menopausal osteoporosis with

estrone micro-crystal precipitates. *Gynaecologia, 133:* 1-10, 1952.

8131. Snapper, I.: Osteoporosis. *Med. Clin. N. Amer., 36:* 865-874, 1952.

8132. Turano, L.: Studio radiologico dello scheletro senile. *Riv. Geront. Geriat., 2:* 121-123, 1952.

See also No. 8012.

XV-E. Skeletal System: *Arthritis and Rheumatism*

8133. Anttonen, V. M., H. J. Rinne and A-L. Rinne: Effect of lumbar sympathectomy on experimental arthritis. *Ann. Med. exp. Biol. Fenn., 29:* 284-286, 1951. Abstr: *B. A., 26:* No. 25080, 1952.

8134. Barter, R. W.: Familial incidence of rheumatoid arthritis and acute rheumatism in 100 rheumatoid arthritics. *Ann. rheumat. Dis., 11:* 39-46, 1952.

8135. Bauer, W., W. S. Clark, and J. P. Kulka: Aortitis and aortic endocarditis; an unrecognized manifestation of rheumatoid arthritis. *Ann. rheumat. Dis., 10:* 470, Dec. 1951.

8136. Brooke, E. M.: Deaths from rheumatoid arthritis; 1940-1949. *Mon. Bull. Min. Hlth. publ. Hlth. Lab. Serv., Lond., 11:* 57-60, March 1952.

8137. Catoggio, P. M.: Enfermedades reumáticas en la vejez. *Rev. méd. Córdoba, 40:* 58-59, 1952.

8138. Copeman, W. S. C.: Rheumatoid arthritis. *Brit. med. J., 1:* (4769), 1185-1187, 1952.

8139. Cruickshank, B.: Focal lesions in skeletal muscles and peripheral nerves in rheumatoid arthritis and other conditions. *J. Path. Bact., 64:* 21-32, 1952. Abstr: *B. A., 26:* No. 25065, 1952.

8140. Dawson, J. E., and H. B. Salt: Creatine metabolism in arthritis. *Ann. rheumat. Dis., 11:* 23-29, March 1952.

8141. Di Girolamo, L., A. Natoli, V. Patrono, P. Pecora, and E. Zilli: Il rapporto tra 11-ossicorticoidi e 11-dosossicorticoidi nelle urine di individui normali, di addisoniani e di artropatici cronici. *Policlinico. Sez. prat., 58:* 1197-1200, 1951.

8142. Duthie, J. J. R.: Rheumatic diseases in the U.S.A. *Brit. med. J., 1:* (4754), 341-347, 1952.

8143. Edström, G.: Rheumatoid arthritis and trauma. *Acta med. scand., 142:* 11-30, Feb. 1952.

8144. Ehrmann, G., A. Ferstl, A. Neumayr, and J. Schmid: Die Bedeutung der Hämagglutination sensibilisierter Schaferythrozyten bei chronischer Polyarthritis. *Wien. Z. inn. Med., 33:* 81-87, 1952.

8145. Fletcher, D. E., and K. A. Rowley: The radiological features of rheumatoid arthritis. *Brit. J. Radiol., 25:* 282-295, 1952.

8146. Forestier, J., F. Jacqueline and A. Bews: Exploration du couple hypophyse-sur-rénale chez les sujets atteints de spondylarthrite ankylosante. *Pr. méd., 60:* 298-299, 1952.

8147. Fricke, F. J., and J. W. Gersten: Effect of contrast baths on the vasomotor response of rheumatoid arthritis patients. *Arch. phys. Med., 33:* 210-216, 1952.

8148. Gerö, S., L. Mosonyi, K. Rosnyay, and F. Valfy: (Effects of Filatov's tissue extracts on experimental arthritis.) *Kisérletes orvostud., 3:* 427-432, 1951. Abstr: *B. A., 26:* No. 21574, 1952.

8149. Greene, R., J. Vaughan-Morgan, and J. Gammon: The effect on bleeding-time of an extract of blood of patients with rheumatoid arthritis. *Brit. med. J., 1:* (4748), 17-21, 1952.

8150. Holmdahl, D. E.: Etwas über die Morphophysiologie des Gelenkknorpels. *Anat. Anz., 97:* (Suppl.), 101-103, 1951.

8151. Ishmael, W. K.: Degenerative arthritis in the aging. *Geriatrics, 7:* 284-287, 1952.

8152. Jacqueline, F., R. Depraitere and J. Truet: Modifications des protides dans les rhumatismes chroniques inflammatoires. *Rev. Rhumat., Paris, 18:* 527-532, 1951.

8153. Kropp, K., and H. Althoff: Die Dysproteinämie beim Rheumatismus Verus. *Ärtzl. Wschr., 7:* 25-28, Jan. 1952.

8154. Leiber, B.: Zur Altersbiologie des akuten Rheumatismus. *Ärtzl. Wschr., 7:*, (1), 3-7, 1952.

8155. Motulsky, A. G., S. L. Weinberg, O. Saphir, and E. F. Rosenberg: Significance of giant follicular hyperplasia in the lymphadenopathy of rheumatoid arthritis. *Ann. rheumat. Dis., 10:* 486-487, 1951.

8156. Perez Cosio, D.: Aspecto radiológico de las manos en las osteoartrosis senescentes. *Cirug. y Cirujanos., 20:* 69-80, 1952.

8157. Pirani, C. L., and G. A. Bennett: Rheumatoid arthritis; a report of three cases progressing from childhood and emphasizing certain systemic manifestations. *Bull. Hosp. Jt. Dis., 12:* 335-367, 1951.

8158. Rubens-Duval, A.: La réaction de floculation au sulfate de cadmium en rhumatologie. *Sem. méd., Paris, 27:* 890-891, 1951.

8159. Rubens-Duval, A.: Les tests biologiques non spécifiques en rhumatologie. *Sem. méd., Paris, 27:* 1025-1027, 1951.

8160. Siebenmann, R.: Die Wirkung von Desoxycorticosteron-Acetat (DCA) Ascorbinsäure und Cortisone (Compound E) auf die Formalinarthritis der Ratte. *Schweiz. Z. Path. Bakteriol., 15:* (2), 174-203, 1952. Abstr: *B. A., 26:* No. 27848, 1952.

8161. Tschannen, F.: Ueber die neuralpathologische

Genese degenerativer Gelenkleiden. *Med. Klinik., 47:* 304-307, 1952.

8162. Woodmansey, A.: A method of measuring sweat from the hands; some results in rheumatoid arthritis. *Ann. rheumat. Dis., 11:* 57-61, 1952.

XV-E. Skeletal System: *Arthritis and Rheumatism Therapy*

8163. Anttonen, V. M., and H. J. Rinne: The effect of deoxycortone and ascorbic acid on experimental arthritis. *Ann. med. exp. Biol. Fenn., 29:* 93-99, 1951.

8164. Anttonen, V. M., and H. J. Rinne: The effect of tetra-aethylammonium bromide on arthritis. *Ann. med. exp. Biol. Fenn., 29:* 89-92, 1951.

8165. Ashton, P. F.: Modern trends in the treatment of rheumatoid arthritis. *Med. Pr., 227:* 298-301, March 1952.

8166. Ashur, M. E.: Hyaluronidase in treatment of rheumatoid and traumatic disorders of the foot and leg. *J. nat. Ass. Chiropodists., 42:* 29-37, 1952.

8167. Betourne, C.: Le dithiodiodosalicylate d'hexaméthylène-tétramine en therapeutique rhumatismale. *Sem. méd., Paris, 27:* 1032-1033, 1951.

8168. Bishop, P. M. F., and J. H. Glyn: Diabetes caused by ACTH treatment of rheumatoid arthritis. *Proc. roy. Soc. Med., 45:* 168-170, 1952.

8169. Borden, A. L., E. C. Brodie, E. B. Wallraff, W. P. Holbrook, D. F. Hill, C. A. L. Stephens, Jr., R. B. Johnson, and A. R. Kemmerer: Amino acid studies and clinical findings in normal adults and rheumatoid arthritis patients treated with ACTH. *J. clin. Invest., 31:* 375-379, 1952.

8170. D'Agostino, A.: Ultrasuonoterapia a piccole dosi nella cura delle artropatie; risultati ottenuti all'Ospedale San Camilo in Roma. *Acta physiother. rheumat. belg., 6:* 269-270, 1951.

8171. De Blecourt, J. J.: (Copper preparations and certain other agents in therapy of primary chronic polyarthritis.) *Ned. Tijdschr. Geneesk., 95:* 3690-3695, 1951.

8172. Denier, A.: Ultrasonothérapie des arthrites. *Acta physiother. rheumat. belg., 6:* 260-264, 1951.

8173. Devis, R., F. Van Goidsenhoven, J. Vandenbroucke, and P. Lemmens: Essais de traitement des arthrites rhumatoides par le propionate de testostérone, la Δ 5-pregnenolone et la vitamine C à fortes doses. *Acta clin. belg., 7:* 74-80, 1952.

8174. Edström, G.: Effets du microclimat chaud et sec chez les malades arthritiques. *Acta physiother. rheumat. belg., 7:* 43-49, 1952.

8175. Egelius, N., and N. G. Hävermark: Late results of gold treatment in rheumatoid arthritis. *Ann. rheumat. Dis., 11:* 17-22, March 1952.

8176. Fahndrich, W. H.: Die Heilbadbehandlung der rheumatischen Erkrankungen. *Dtsch. med. Wschr., 76:* 1293-1296, 1951.

8177. Godlowski, Z. Z., and H. Paterson: Rheumatoid arthritis of menopausal women treated with insulin hypoglycaemias. *Ann. rheumat. Dis., 11:* 36-38, March 1952.

8178. Harnach, Z.: (Use of procaine in the treatment of arthritis.) *Acta chir. orthop. traum. čech., 19:* 66-69, 1952.

8179. Hench, P. S.: Cortisone, hydrocortisone and corticotropin; some facts and speculations with special reference to rheumatoid arthritis. *Trans. Ass. Life Insur. med. Dir., 35:* 5-33, 1951.

8180. Järvinen, K. A. J.: Observations on the use of thiouracil in rheumatoid arthritis. *Ann. rheumat. Dis., 11:* 47-53, 1952.

8181. Kellgren, J. H., O. Janus, R. Moore, and D. S. Jackson: Responsiveness to ACTH and cortisone in rheumatoid arthritis. *Brit. med. J., 1:* (4766), 997-999, 1952.

8182. Kresbach, E.: Zur Insulinbehandlung der rheumatischen Arthritis. *Wien. klin. Wschr., 64:* 257, 1952.

8183. Kuipers, R. K. W.: Influencia de la testosterona sobre el reumatismo articular inflamatorio crónico. *Rev. méd. Peruana, 22:* 813-821, 1951.

8184. Zuzell, W. C., R. W. Schaffarzick, B. Brown, and E. A. Mankle: Phenylbutazone (butazolidin) in rheumatoid arthritis and gout. *J. Amer. med. Ass., 149:* 729-734, 1952.

8185. Lefkovits, A. M., and A. L. Bellott: Observations on the effects of some steroid compounds other than cortisone in the treatment of patients with rheumatoid arthritis. (Abstract). *Memphis med. J., 26:* (11), 161-166, 1951. Abstr: *B. A., 26:* No. 27824, 1952.

8186. Lenoir, A.: Traitement des douleurs articulaires au moyen des ultrasons. *Acta physiother. rheumat. belg., 6:* 265-268, 1951.

8187. Meins, G.: Die deformierende Kniegelenksarthrose und ihre chirurgische Behandlung. *Zbl. Chir., 76:* 1279-1283, 1951.

8188. Merchante, A., J. Perianes, E. Lopez García, and C. Jiménez Diaz: Experiencia ulterior en el tratamiento de la artritis reumatoide con mostaza-nitrógeno. *Rev. clin. esp., 43:* 11-16, 1951.

8189. Mitchell, W. R. D.:: Management of the arthritic hip. *Med. Pr., 227:* 265-268, 1952.

8190. Monari, G., and S. Maggiorani: Il trattamento delle artropatie reumatiche con l'associazione

piramidone-butazolidina. *Minerva med., Torino, 42:* 806-809, 1951.

8191. Paltrinieri, M.: L'acido glicuronico nelle artropatie. *Minerva med., Torino, 43:* 267-270, 1952.

8192. Samson, J. E., and G. Lafond: La synovectomie dans l'arthrite chronique du genou. *Rev. chir. orthrop., 37:* 395-407, 1951.

8193. Selke, O. O., Jr.: Conservative treatment of degenerative arthritis of the knee. *Sth. med. J., Birmingham, 45:* 358-360, 1952.

8194. Serra-Peralba, A., C. Angenault, and R. de Dalmases: Estudio sobre la fectividad antirruematica del irgapyrin. *Prensa méd. argent., 39:* 309-404, Feb. 1952.

8195. Simonart, E. F.: Quinze ans de chrysotherapie dans le rhumatisme articularie chronique. *Rev. Rhumat., Paris, 18:* 569-571, 1951.

8196. Snorrason, E.: (Systematic recording of follow-up in therapy of chronic polyarthritis.) *Ugesk. Laeg., 113:* 1702-1704, 1952.

8197. Tellez, J., R. Pichard, and C. Larrain: Tratamiento de la artritis reumatoide con mostaza nitrogenada. *Rev. clín. esp., 42:* 377-382, 1951.

8198. Vignon, G., and L. Berthier: Indications et resultats d'un pyramidon pyrazole injectable en rhumatologie. *Lyon méd., 186:* 97-102, 1952.

XV-E. Skeletal System: *Gout*

8199. Bonnett, G. F.: Goutte et myxoedeme. *Rev. Rhumat., Paris, 18:* 553-554, 1951.

8200. Isemein, L., and V. Maymard: Rhumatisme goutteux polyarticulaire fébrile résistant à la cortisone et à l'ACTH gueri par pyrétotherapie. *Rev. Rhumat., Paris, 19:* 60-61, 1952.

8201. Izar, G.: Gotta-iperuricemia; loro trattamento. *Minerva med., Torino, 43:* 291-294, 1952.

8202. Levin, M. H., L. Fred and S. H. Bassett: Metabolic studies in gout. *J. clin. Endocrinol. & Metab., 12:* 506-518, 1952. Abstr: *B. A., 26:* No. 24605, 1952.

8203. Rimbaud, L., H. Serre and J. Mirouze: Le pied goutteux. *Rhumatologie,* No. 6, 231-239, Nov.-Dec. 1951.

8204. Serane, J.: Trois aspects cliniques fréquents de la goutte. *Pr. méd., 60:* 354, 1952.

XVI. Skin and Integument

8205. Baumann, R.: Die Behandlung der varicösen Unterschenkelgeschwüre mit dem Schaumgummikompressionsverband. *Artzl. Wschr., 7:* 90-91, 1952.

8206. Boulle, S.: Traitement externe de l'ulcère de jambe. *Pr. méd., 60:* 456, March 1952.

8207. Dick, J. C.: The tension and resistance to stretching of human skin and other membranes, with results from a series of normal and oedematous cases. *J. Physiol., 112:* 102-113, 1951.

8208. Grenier, J.: Traitement des ulcères de jambe. *Strasbourg-méd., 2:* 716-722, 1951.

8209. Guillot, C. F.: Senilidad y canicie. *Rev. méd. Córdoba, 40:* 59, 1952.

8210. Hertz, C.: Une enquête sur le traitement des ulcères de jambe. I. La chirurgie des ulcères de jambe. *Vie méd., 32:* 13-16, Dec. 1951.

8211. Huriez, C., F. Desmons and R. Dusausoy: Résultats de l'application de solution de digitale sur une première série d'ulcères de jambes. *Bull. Soc. franç. Derm. Syph., 58:* 562-563, Nov.-Dec. 1951.

8212. Prakken, J. R.: Colloid and senile degeneration of the skin. *Acta derm.-venereol., Stockh., 31:* 713-722, 1951.

8213. Woringer, F.: La sénescence de la peau. *Strasbourg-méd., 2:* 696-706, 1951.

See also No. 8162.

XVII. Urogenital System (includes prostate)

8214. Allenmann, R.: Prostatahypertrophie und Prostatakrebs, ein Beitrag zur Frage der okkulten Karzinome. *Schweiz. med. Wschr., 82:* 147-154, 1952.

8215. Badenoch, A. W.: The treatment of carcinoma of the prostate. *Practitioner, 168:* (1006), 425-427, 1952.

8216. Brueziere, J.: Volumineuse tumeur maligne de la prostate. *J. Urol. méd. chir., 57:* 815-817, 1951.

8217. Chauvin, E.: La cancérisation de la loge prostatique après prostatectomie. *J. Urol. méd. chir., 57:* 772-783, 1951.

8218. Crowley, E.: Further experiences with transurethral prostatectomy. *Trans. west. Sect. Amer. urol. Ass., 18:* 180-183, 1951.

8219. Dodson, A. I., A. J. Chenery, and J. W. Choate: The effect of prostatectomy on hypertension. *Amer. Surg., 18:* 260-265, 1952.

8220. Fort, A.: Cáncer de prostata; aprotación al tema. *An. Cirug. 16:* 213-223, 1951.

8221. Glanton, J. B., L. M. Orr, and J. C. Hayward: Postoperative treatment following prostatic surgery. *J. Urol., 67:* 533-536, 1952.

8222. Golden, M., and B. S. Abeshouse: Prostatic calculi and neoplasm. *Sinai Hosp. J., 1:* 20-28, March 1952.

8223. Herbst, W. P.: Metabolic management of advanced prostatic cancer. *Arch. Surg., Chicago, 64:* 828-834, 1952.

8224. Herrmann, G.: Die chronische unspezifische Prostatistis und ihre derzeitige Behandlung. *Münch. med. Wschr., 94:* 385-391, 1952.

8225. Hess, E., R. B. Roth, and A. F. Kaminsky: The aftermath of prostatectomy. *Trans. west. Sect. Amer. urol. Ass., 18:* 30-34, 1951.

8226. Huffman, J. W., and J. K. Sokol: The management of stress incontinence. *Geriatrics, 7:* 225-231, 1952.

8227. Jackman, R. J., and J. R. Anderson: Proctologic manifestations of carcinoma of the prostate. *Amer. J. Surg., 83:* 491-495, 1952.

8228. Jakobsen, A. H. I.: The influence of oestrogenic hormones on the prostate; artificial hormone administration, in the normal human prostate at birth and in cases of senile hyperplasia of the prostate. *Acta path. microbiol. scand., 29:* 419-425, 1951.

8229. Jiménez Diaz, J.: Prostatismo. *Rev. clín. esp., 42:* 373-376, 1951.

8230. Lumb, W. V.: Prostatic calculi in a dog. *J. Amer. vet. Med. Ass., 121:* 14-16, 1952.

8231. Noszkay, A.: (Results of 528 operations on the prostate and neck of the bladder.) *Mag. Sebészet., 4:* 281-293, 1951.

8232. O'Conor, V. J., and J. K. Sokol: Evaluation of TACE as a therapeutic agent in prostatic carcinoma. *Quart. Bull. Nthwest. Univ. med. Sch., 26:* 161-162, 1952.

8233. Ostenfeld, J.: Retropubic surgery in benign prostatic lesions; analysis and follow-up. *Acta chir. scand., 102:* 447-456, 1952.

8234. Pereira, A.: Prostatectomia retropúbica; consideraçoes estatísticas. *J. méd. Pôrto, 17:* 744-745, 1951.

8235. Scheinman, L. J.: Experiences with retropubic prostatectomy. *Northw. Med., Seattle, 51:* 118-119, 1952.

8236. Tholen, A.: Prostatismus bei der Frau. *Gynaecologia, 132:* 389-394, 1951.

8237. Trabucco, A. E., and R. J. Borzone: Como procurar el diagnóstico oportuno del cáncer vesicoprostático. *Prensa méd. argent., 39:* 803-810, 1952.

8238. Tzschirntsch, K.: Betrachtungen zur Therapie des Prostatakarzinoma. *Z. Urol., 44:* 785-792, 1951.

8239. Viala, P. J., T. Grosz, J. Chrome, and R. Du Boistesselin: Vérifications expérimentales à propos des frottis prostatiques. *Sem. Hôp., Paris, 28:* 142-145, Jan. 1952.

8240. Wesson, M. B.: The rationale of prostatectomy. *Amer. J. Surg., 82:* 714-719, 1951.

8241. Wildegans, —.: Diagnostische Prostatapunktion bei Karzinomverdacht. *Zbl. Chir., 77:* 161-162, 1952.

8242. Wilhelm, S. F.: Carcinoma of the prostate; with particular reference to hormonal treatment. *Med. Clin. N. Amer., 36:* 689-704, 1952.

GERIATRICS

I. General Orientation

8243. Alvarez, W. C.: Geriatrics, a specialty? *Geriatrics, 7:* 250-251, 1952.

8244. Fong, T. C.: The new geriatric unit at Saint Elizabeths Hospital. *Med. Ann. District of Columbia, 21:* 223-224, 1952.

8245. Hanssen, P.: (Geriatric problems.) *Tidssk. norske LaegeForen., 71:* 798-801, 1951.

8246. Spota, B. B.: Envelhecimento em seu aspecto conceptual, projecão clínica da geriatria. *Arq. neuropsiquiat., 9:* 356-361, 1951.

8247. Van Driessche, A.: (Introduction to geriatrics.) *Belg. Tijds. Geneesk., 8:* 83-89, 1952.

II. and III. Medical Care and Diagnosis

8248. Burney, L. E., and M. O'Malley: Improving health care in private and public nursing homes. *Geriatrics, 7:* 252-258, 1952.

8249. Hoffer, C. R., D. L. Gibson, C. P. Loomis, P. A. Miller, E. A. Schuler, and J. F. Thaden: *Health needs and health care in Michigan; report of a state-wide survey.* Mich. State Coll., Agric. Exper. Station, Dept. of Sociol. & Anthrop., East Lansing, Mich., June 1950, Spec. Bull. 365, 94 pp.

8250. Ranck, M., and —. Cunningham: The health department and nursing homes. *Publ. Hlth. Rep., Wash., 67:* 829-834, 1952.

See also Nos. 7867, 8244.

IV. Disease
(chronic, infectious, and mental)

8251. Alvarez, W. C.: The aging woman. *Geriatrics, 7:* 295-296, 1952.

8252. Ceci, D.: Rehabilitación del enfermo crónico y del invalido. *Día méd., 24:* 347-348, 1952.

8253. Collins, S. D.: Trends in illness and mortality. *Publ. Hlth. Rep., Wash., 67:* (5), 492-495, 1952.

8254. Coulter, J. E., and D. Tucher: The risk of attack of respiratory illness among parents of children of various ages. *Milbank mem. Fd. quart. Bull., 29:* 423-439, 1951. Abstr: *B. A., 26:* No. 25488, 1952.

8255. Dogliotti, G. C., G. Lenti, and C. Mattei: Cancro e vecchiaia. *Riv. Geront. Geriat., 2:* 123-127, 1952.

8256. Exton-Smith, A. N.: An investigation of the aged sick in their homes; a survey of 215

patients in the boroughs of St. Pancras. *Brit. med. J., 2:* 182-186, 1952.

8257. Gregory, I.: Nicotinic acid therapy in psychoses of senility. *Amer. J. Psychiat., 108:* 888-895, 1952.

8258. Herkimer, J. K., and J. A. M. Meerloo: Treatof mental disturbances in elderly women. *J. soc. Casework, 32:* 419-425, 1951.

8259. Hiller, F.: Electric shock treatment in older individuals; its indication in various psychotic disorders and its mode of action. *Quart. Bull. Nthwest. Univ. med. Sch., 26:* 124-132, 1952.

8260. Hueper, W. C.: Age aspects of environmental and occupational cancers. *Publ. Hlth. Rep., Wash., 67:* 773-779, 1952.

8261. Langenbeck, B.: Zur Kenntnis der relativen Gutartigkeit des Alterskarzinoms. *Arch. Ohr- usw. Hk. und Z. Hals- usw. Hk.,* 159: 392, 1951.

8262. McKeown, T., and C. R. Lowe: A scheme for the care of the aged and chronic sick. *Brit. med. J., 2:* 207-210, 1952.

8263. Nečas, J.: (Prediction of certain chronic diseases according to life insurance experiences.) *Prakt. lék, Praha, 32:* 63-66, Feb. 1952.

8264. O'Sullivan, M.: The problem of the aged sick as seen by the general practitioner. *Brit. med. J., 1:* (4771), 1297-1298, 1952.

8265. Papez, J. W., and J. F. Bateman: Changes in nervous tissues and study of living organisms in mental disease. *J. nerv. ment. Dis., 114:* 400-412, 1951.

8266. Para, M.: Dados estatísticos de viscerotomia sôbre doenças de condiçoes mórbidas do homem no Brasil. 2. Malária no período de 1937-1946. *Mem. Inst. Osw. Cruz., 48:* 293-339, 1950. Abstr: *B. A., 26:* No. 22943, 1952.

8267. Puente Duany, N., and C. Ramírez Corredeira: El cáncer en los asilos de ancilanos. *Rev. méd. cubana, 62:* 745-765, 1951.

8268. Roch, M.: La vieillesse et les maladies des vieillards. *Schweiz. med. Wschr., 82:* 193-196, 1952.

8269. Stringham, J. A.: Rehabilitating chronic neuropsychiatric patients. *Amer. J. Psychiat., 108:* 924-928, 1952.

8270. Vallejo Nagera, A.: La psicoterapía religiosa contra los complejos de los enfermos crónicos. *Clin. Labor., Zarogoza, 53:* 81-89, Feb. 1952.

8271. Woolsey, T. D.: Two surveys of disabling illness. *Publ. Hlth. Rep., Wash., 67:* (8), 807-810, 1952.

See also Nos. 7991, 7996, 8009, 8050, 8302, 8389, 8430.

V. Hygiene

8272. Cushing, J. G. N.: Problems of retirement. *Ment. Hyg., N. Y., 36:* 449-455, 1952.

8273. Dowling, H. F., and D. Shakow: Time spent by internists on adult health education and preventive medicine. *J. Amer. med. Ass., 149:* 628-631, 1952.

8274. Great Britain. National Old People's Welfare Committee: *Notes for those nearing and over sixty.* Nat. Counc. Soc. Serv., Inc., London, Oct. 1951, 10 pp.

8275. Yde, A.: (Guidance in mental hygiene for adults; considerations on one year of activity.) *Ugesk. Laeg., 114:* 340-347, 1952.

VII. Surgery

8276. Ahumada, J. C., A. Nogues and H. Guiza: La patología quirúrgigica en mujer de edad avanzada. *Rev. méd. Córdoba, 40:* 55, 1952.

8277. Berenguer, A. E., and E. J. Alberoni: Cirugía en geriatría. *Prensa méd. argent., 39:* 199-201, 1952.

8278. Bonilla Naar, A.: Cirugía del tórax en los ancianos. *Med. & cir., Bogotá, 16:* 157-169, 1952.

8279. Haug, C. A., and W. A. Dale: Major surgery in old people. *Arch. Surg., Chicago, 64:* 421-437, 1952.

8280. Perez, B.: Cirugía geriátrica. *Rev. méd. Córdoba, 40:* 56, 1952.

8281. Plotegher, A.: Sull'intervento chirurgico nei vecchi. *Ann. ital. Chir., 28:* 686-694, 1951.

8282. Ryan, A. J.: Surgery in the patient over seventy. *Ann. intern. Med., 36:* 1437-1443, 1952.

See also No. 7923.

PSYCHOLOGICAL PROCESSES

8283. Behrens, H. D., and R. F. Nester: Intellectual changes during maturity and old age. *Rev. educ. Res., 20:* 361-366, 1950. Abstr: *P. A., 26:* No. 4701, 1952.

8284. Bingham, W. E., and W. J. Griffiths, Jr.: The effect of different environments during infancy on adult behavior in the rat. *J. comp. physiol. Psychol., 45:* 307-312, 1952.

8285. Canepa, G.: La valutazione dell'intelligenza nell'adulto. II. Adattamento italiano della scala Wechsler-Bellevue. *Sistema nerv., 3:* 465-481, 1951.

8286. Desai, M.: The test-retest reliabliity of the progressive matrices test. *Brit. J. med. Psychol., 25:* 48-53, 1952.

8287. Dorland, W. A. M.: The triumph of maturity. II. The achievements of maturity which the

world might have passed. *Welfare Mag., 18:* 1444-1466, 1927.

8288. Fedorov, V. K.: (Age changes in the liability of nervous processes.) *Fiziol. Zh. S.S.S.R., 37:* 446-452, 1951. Abstr: *P. A., 26:* No. 5280, 1952.

8289. Feifel, H.: Qualitative differences in the vocabulary responses of normals and abnormals. *Genet. Psychol. Monogr., 39:* 151-204, 1949.

8290. Ferracuti, F., and G. Sbrana: La rapiditá di spostamento dell'attenzione e le caratteristiche di tale funzione in rapporto all'età studiate mediante il reattivo di bedini. *Riv. Geront. Geriat., 2:* 141-150, 1952.

8291. Finkelstein, M., R. Gerboth, and R. Westerhold: Standardization of a short form of the Wechsler Vocabulary Subtest. *J. clin. Psychol., 8:* 133-135, 1952.

8292. Ginzberg, R.: The negative attitude toward the elderly. *Geriatrics, 7:* 297-302, 1952.

8293. Goossen, C. V.: The Goossen hidden intelligence test. *Publ. Opin. Quart., 14:* 759-766, 1950. Abstr: *P. A., 26:* No. 4808, 1952.

8294. Griffiths, W. J., Jr., and W. F. Stringer: The effects of intense stimulation experienced during infancy on adult behavior in the rat. *J. comp. physiol. Psychol., 45:* 301-306, 1952.

8295. Gurvitz, M. S.: Some defects of the Wechsler-Bellevue. *J. consult. Psychol., 16:* 124-126, 1952.

8296. Herring, F. H.: An evaluation of published short forms of the Wechsler-Bellevue scale. *J. consult. Psychol., 16:* 119-123, 1952.

8297. Kay, H.: Learning of a serial task by different age groups. *Quart. J. exp. Psychol., Cambr., 3:* 166-183, 1951. Abstr: *P. A., 26:* No. 4706, 1952.

8298. Lumière, A.: Variation de la mortalité par suicide à Paris de 1925 a 1949. *Avenir méd., Lyon, 48:* 3-5, 1951. Abstr: *P. I., 18:* No. 1323, 1952.

8299. Luzzatto, F.: I limiti d'età nelle professioni intellettuali. *Longevitá, 1:* 3-4, May-June 1952.

8300. McKelvey, R. K., and M. H. Marx: Effects of infantile food and water deprivation on adult hoarding in the rat. *J. comp. physiol. Psychol., 44:* 423-430, 1951. Abstr: *P. A., 26:* No. 400, 1952.

8301. Origlia, D.: Profilassi pedagogica delle irregolarità della vecchiaia. *Longevitá, 1:* 12-17, May-June 1952.

8302. Pinkerton, P., and J. Kelly: An attempted correlation between clinical and psychometric findings in senile-arterio-sclerotic dementia. *J. ment. Sci., 98:* 244-255, 1952.

8303. Price, B.: The grasping of spoken directions as an age function in adults. *Psychol. Bull., 30:* 588-589, 1933.

8304. Richardson, H. M., and N. G. Hanawalt: Leadership as related to the Bernreuter personality measures. V. Leadership among adult women in social activities. *J. soc. Psychol., 36:* 141-153, 1952.

8305. Simpson, R. M.: Psychoneurotic inventory of penitentiary inmates. *J. soc. Psychol., 5:* 56-64, 1934.

8306. Smith, M. E.: Childhood memories compared with those of adult life. *J. gen. Psychol., 80:* 151-182, 1952.

8307. Smith, M. E.: A comparison of certain personality traits as rated in the same individuals in childhood and fifty years later. *Child Develop., 23:* 159-180, 1952.

8308. Tuckman, J., and I. Lorge: The best years of life; a study in ranking. *J. Psychol., 34:* 137-149, 1952.

8309. Warren, R. L.: *Old age in a rural township.* In: T. C. Desmond (chairman), Age is No Barrier. N. Y. State Joint Legis. Commit. on Probl. of Aging, Legis. Doc. No. 35, 1952, pp. 155-166.

8310. Wechsler, D.: *Range of human capacities.* Williams & Wilkins, 2nd Edition, Baltimore, 1952, 190 pp.

8311. Willoughby, R. R.: Neuroticism in marriage. *J. soc. Psychol., 5:* 3-36, 1934.

8312. Zuckerman, M.: The effect of threat on perceptual affect in a group. *J. abnorm. (soc.) Psychol., 46:* 529-533, 1951. Abstr: *P. A., 26:* No. 402, 1952.

See also Nos. 8272, 8275, 8375, 8397.

SOCIAL AND ECONOMIC ASPECTS

I. Accidents

8313. Travis, R. C., N. B. Webb, and J. Burke: *Age and experience in relation to aircraft accidents.* Off. of the Deputy Inspector General, USAF, Norton Air Force Base, June 1951, Publ. No. M-28.

8314. U. S. Federal Security Agency. Public Health Service. National Office of Vital Statistics: Motor-vehicle accident fatalities; United States, 1949. *Vit. Stat., Spec. Rep., Nat. Summaries, 36:* (21), 414-465, 1952.

8315. Anonymous: *Influence of age and experience on aircraft accident rates.* Off. of the Air Surgeon, Headquarters, A.A.F., Statistical Branch, Dec. 1945.

III. Demography

8316. Appell, P.: Les conséquences militaires du vieillissement de la population. *All. nat. Dépop., 4:* 89-95, 1948. Abstr: *P. I., 15:* No. 1, 1949.

8317. Argentina. Dirección General del Servicio Estadístico Nacional: *IV censo general de la nación, 1947. Resultados generales del censo de población.* Informe D. 1, B. Aires, 1951, 40 pp. Abstr: *P. I., 18:* No. 665, 1952.

8318. Argentina. Instituto Alejandro E. Bunge de Investigaciones Económicas y Sociales: La problación argentina según sexo y grupos de edades. *Rev. Econ. Argent., 50:* (400-402), 100, 1951. Abstr: *P. I., 18:* No. 1208, 1952.

8319. Bardet, G.: Observations sur le vieillissement urbain. *All. nat. Dépop., 2:* 123-132, 1948. Abstr: *P. I., 15:* No. 1, 1949.

8320. Bernardes, L. M. C.: Distribuição da população no estado do Paraná em 1940. *Rev. brasil. Estatist., 12:* 565-582, 1950. Abstr: *P. I., 18:* No. 1210, 1952.

8321. Boldingh, L. G.: (Population data of South New Guinea.) *Indonesië, 5:* 41-72; 167-185; July-Sept. 1951. Abstr: *P. I., 18:* No. 1272, 1952.

8322. Bourgeois-Pichat, J.: Dans quelle mesure peut-on limiter le vieillissement de la population? *All. nat. Dépop., 2:* 63-75, 1948. Abstr: *P. I., 15:* No. 1, 1949.

8323. Boverat, F.: Principes de la politique démographique qu'impose le vieillissement de la population. *All. nat. Dépop., 4:* 112-119, 1948. Abstr: *P. I., 15:* No. 1, 1949.

8324. Brazil. Instituto Brasileiro de Economia: A população do Distrito Federal através dos censos; algumas características. *Conjuntura Econ., 6:* 34-39, 1952. Abstr: *P. I., 18:* No. 1211, 1952.

8325. Candiani, M.: Aspetti quantitativi del problema della vecchiaia. *Longevitá, 1:* 31-32, May-June 1952.

8326. Castellano, V.: La popolazione italiana dell'Eritrea dal 1924 al 1940. *Riv. ital. Statist., 2:* 530-540, 1948. Abstr: *P. I., 16:* No. 732, 1950.

8327. Ceylon. Government: *Census of the Maldive Islands; 1946.* Ceylon Government Gazette, Part I, (9612), 1773, Oct. 11, 1946. Abstr: *P. I., 15:* No. 1188, 1949.

8328. Chandra Sekar, C.: Some aspects of Parsi demography. *Hum. Biol., 20:* 47-89, 1948. Abstr: *P. I., 15:* No. 128, 1949.

8329. Chia-Lin, P.: The population of Libya: *Population Stud., 3:* 100-125, 1949. Abstr: *P. I., 16:* No. 32, 1950.

8330. Cuba. Salubridad y Asistencia Social: Informe anual sanitario y demográfico de la República de Cuba. *Bol. Oficial, 50:* 103-119, 1947. Abstr: *P. I., 15:* No. 712, 1949.

8331. Daric, J.: Evolution de la structure par âge de la population active. *All. nat. Dépop., 2:* 45-53, 1948. Abstr: *P. I., 15:* No. 1, 1949.

8332. Depoid, P.: Perspectives d'avenir de la composition par âge de la population française. *All. nat. Dépop., 2:* 18-31, 1948. Abstr: *P. I., 15:* No. 1, 1949.

8333. East Africa High Commission. Statistical Department: Population. *E. Afr. econ. statist. Bull.,* No. 12, 1-11, June 1951. Abstr: *P. I., 18:* No. 744, 1952.

8334. Faes, J.: La population de la Belgique et des Pays-Bas. *Bull. Statist., 35:* 1835-1838, 1949. Abstr: *P. I., 16:* No. 684, 1950.

8335. Fonsagrive, V.: Qu'attendre des variations de la nuptialité, de la natalité et de la mortalité pour stabiliser la composition par âge et limiter le vieillissement de la population? *All. nat. Dépop., 2:* 76-89, 1948. Abstr: *P. I., 15:* No. 1, 1949.

8336. Fonsagrive, V.: Evolution de la structure par âge de la population française. *All nat. Dépop., 2:* 6-17, 1948. *P. I., 15:* No. 1, 1949.

8337. France. Institut National de la Statistique et des Etudes Economiques: Le mouvement naturel de la population au cours de l'année 1949. *Bull. Men. Statist.,* Suppl. July-Sept., 1951, pp. 1-22. Abstr: *P. I., 18:* No. 684, 1952.

8338. France. Institut National de la Statistique et des Etudes Economiques: Les problèmes démographiques de l'Asie. *Étud. Conjonct., 6:* 3-12, Nov.-Dec. 1951. Abstr: *P. I., 18:* No. 1120, 1952.

8339. France. Service Colonial des Statistiques: Résultats du recensement de 1946 dans les territoires d'Outre-Mer. Français d'origine métropolitaine et étrangers. Madagascar. *Bull. Mens. Statist. d'Outre-Mer.,* (Suppl. Série Statist., No. 9), 1-56, 1949. Abstr: *P. I., 15:* No. 1203, 1949.

8340. France. Service Colonial des Statistiques: Résultats du recensement de 1946 dans les territories d'Outre-Mer. Guyane' et Inini. *Bull. Mens. Statist. d'Outre-Mer.,* (Suppl. Série Statist., No. 7,) 1-44, 1948. Abstr: *P. I., 15:* No. 615, 1949.

8341. Gasc, P.: Etude de la structure par âge de la population en differents pays et de son évolution; comparaison de la structure par âge de la population en diverses régions de la France. *All. nat. Dépop., 2:* 32-44, 1948. Abstr: *P. I., 15:* No. 1, 1949.

8342. Guillou, —.: A repartição dos médicos segundo

as idades em França. *J. méd., Pôrto, 16:* 887, 1950.

8343. Henry, L.: L'immigration comme remède au vieillissement de la population. *All. nat. Dépop., 2:* 90-93, 1948. Abstr: *P. I., 15:* No. 1, 1949.

8344. Lah, I.: (The population of the Federal People's Republic of Yugoslavia in the 1948-1960 period; demographic perspective.) *Statist. Revija, 1:* (3-4), 372-391, Nov. 1951. Abstr: *P. I., 18:* No. 714, 1952.

8345. Laureau, J.: Influence du vieillissement de la population sur les retraites. *All. nat. Dépop., 2:* 110-122, 1948. Abstr: *P. I., 15:* No. 1, 1949.

8346. Lorimer, F.: *Dynamics of age structure in a population with initially high fertility and mortality.* United Nations, Population Div., Population Bull., No. 1, pp. 31-41, Dec. 1951. Abstr: *P. I., 18:* No. 1132, 1952.

8347. New Zealand. Census and Statistics Department: Maori population - age groups. *Mon. Abstr. Statist.,* Sept. 1948, pp. 1-3. Abstr: *P. I., 15:* No. 153, 1949.

8348. Sarkar, N. K.: An estimate of the future population of Ceylon. *Ceylon Economist, 1:* 167-168, Nov. 1950. Abstr: *P. I., 18:* No. 721, 1952.

8349. Schmid, C. F.: *Age and sex distribution of the population.* Houghton Mifflin, Boston, 1951, 362 pp. Abstr: *P. I., 18:* No. 1143, 1952.

8350. Smith, T. L., and H. L. Hitt: *The people of Louisana.* Louisana St. Univ. Press, 1952, xviii, 272 pp. Abstr: *P. I., 18:* No. 1156, 1952.

8351. Taback, M.: Report of the subcommittee on statistics of the Baltimore City Commission on Aging and problems of the aged. *Baltimore Hlth. News, 29:* 50-56, 1952.

8352. United Nations: *Demographic yearbook 1949-1950.* Columbia Univ. Press, N. Y., 1951, 2nd Edition, 558 pp.

8353. United Nations. Population Commission: *Findings of studies on the relationship between population trends and economic and social factors. Three parts.* The Commission, April 11, 1950, E/CN.9/55, j70 pp., *Ibid.,* May 1, 1950, 88 pp., and *Ibid.,* May 2, 1950, 14 pp.

8354. United Nations. Population Division: Some quantitative aspects of the aging of Western populations. *Population Bull.,* No. 1, pp. 42-57, Dec. 1951. Abstr: *P. I., 18:* No. 1163, 1952.

8355. United Nations. World Health Organization: The present state of population growth. *Epid. Vital Statist. Rep., 1:* 332-338, 1948. Abstr: *P. I., 15:* No. 157, 1949.

8356. Van den Brink, T.: *Some quantitative aspects of future population development in the Netherlands.* Martinus Nijhoff, Hague, 1952, viii, 58 pp. Abstr: *P. I., 18:* No. 1109, 1952.

See also Nos. 7890, 7894, 7895.

IV. Economic Problems

8357. Létinier, G.: Vue d'ensemble des conséquences économiques du vieillissement. *All. nat. Dépop., 4:* 7-11, 1948. Abstr: *P. I., 15:* No. 1, 1949.

See also No. 8413.

IV-B. Economic Problems: *Employment*

8358. Clague, E.: Employment problems of the older worker. *Mon. Labor Rev., 65:* 662-663, 1947.

8359. Dublin, L. I., and R. J. Vane: Occupational mortality experience of insured wage earners. *Mon. Labor Rev., 64:* 1003-1018, 1947.

8360. Dutchess, C. E.: Economic problems of older population necessitate re-evaluation of workers' usefulness. *Occup. Hlth., 12:* 163-164, 1952.

8361. Kuh, C.: Employment of the older worker; a challenge to industry and public health. *Amer. J. publ. Hlth., 42:* 699-704, 1952.

8362. Metropolitan Life Insurance Company: Maximum hiring age practices surveyed. *Factory Mgmt., 106:* 222-226, 1948.

8363. Ringe, H. H., and S. Cooper: Employment and economic status of older men and women; May 1952. *Bur. labor Bull., 1092:* 1-55, 1952.

8364. Tuckman, J., and I. Lorge: Experts' biases about the older workers. *Science, 115:* 685-687, June 1952.

8365. Turner, A. N.: *Employment and retirement in an aging population; a bibliography.* Harvard Univ., Grad. Sch. of Busi. Admin., Baker Library, Boston, 1952, Ref. List No. 10, 50 pp. Abstr: *P. I., 18:* No. 1556, 1952.

8366. U. S. Federal Security Agency. Social Security Administration: Quarterly summary of wage, employment and benefit data. *Bur. Old-Age and Surv. Insur., Div. Prog. Anal., 12:* (2), Aug. 1952. (Mimeogr.)

8367. Wiggamon, M. T.: New techniques for getting jobs. *Mon. Labor Rev., 50:* 797-806, 1940.

8368. Wilson, E. W.: Pensions or jobs for the aged? *Amer. econ. Sec., 4:* 16-20, Oct. 1947.

8369. Anonymous: Older population brings new job problem; one in every 8 persons will be 65 in 2000 A.D.: *Labor Inform. Bull., 14:* 3, March 1947.

8370. Anonymous: *Oldsters valuable in technical jobs.* Business Wk., June 1952, p. 152.

See also No. 8428.

IV-C. Economic Problems: *Retirement and Pensions*

(See also Social Security)

8371. Ackerman, L. J., and W. C. McKain, Jr.: Retirement programs for industrial workers.

Harv. Bus. Rev., 30: 97-107, 1952.

8372. American Management Association: *Employee benefit plans and collective bargaining.* Amer. Mgmt. Ass., Personnel Series No. 123, 1949.

8373. Bourgeois-Pichat, J.: A propos des retraites. I. Le problème. *Concours med., 74:* 413-415, 1951.

8374. Cahs, W. J. (Chairman). *Report of the Illinois Public employees' pension laws commission, submitted pursuant to the provisions of an act of the 65th General assembly, approved August 8, 1947.* Illinois: Publ. Emp. Pension Laws Comm., Springfield, Ill., 1949, 130 pp.

8375. Exton, W., Jr.: Preparing employees for successful retirement. *Personnel J., 28:* 264-274, 1951. Abstr: *P. A., 26:* No. 4704, 1952.

8376. McClanahan, W. S.: Estate planning for physicians. IV. Planning as retirement approaches. *J. Amer. med. Ass., 149:* 562-568, 1952.

8377. Remmlein, M. K.: Social Security Act amendments of 1950; teacher retirement. *Scholastic, 61:* 16, Sept. 1952.

8378. Stryker, P.: When should workers retire? *Fortune, 46:* 110-112, 1952.

8379. U. S. Civil Service Commission. Library: *Social security and public employee retirement systems.* In: A Bibl. of Publ. Personnel Adm. Literature, 1949, VI. pp. 30-32.

8380. Anonymous: National conference on retirement of older workers. *Mon. Labor Rev., 74:* 670-672, June 1952.

8381. Anonymous: NEA and AFT disagree on teacher pension, policies. *Scholastic, 60:* 8, May 1952.

8382. Anonymous: Some observations on the "funding" pensions. (Editorial). Commercial and Financial Chronicle, N. Y., 170: (4860), 1; 31; Dec. 1949.

V. Education

8383. Gebhard, B.: Grandma goes to school. *Amer. J. publ. Hlth., 42:* 1052, 1952.

8384. U. S. Bureau of the Census: *Educational attainment of the population 25 years old and over, for the United States; 1950.* The Bureau, May 1952, No. 6, 9 pp. Abstr: *P. I., 18:* No. 1192, 1952.

See also No. 8273.

VI. Housing and Care

8385. Berggren, A.: (Geriatric research and care of aged; treatment of residents in old age homes from the geriatric point of view.) *Svenska Läkartidn., 48:* 3070-3080, 1951.

8386. Bini, V.: Centro di lavoro urbano. *Longevitá, 1:* 10-11, May-June 1952.

8387. Daric, J.: Vieillissement de la population, besoins et niveau de vie des personnes âgées. *Population, 7:* 27-48, 1952. Abstr: *P. I., 18:* No. 1115, 1952.

8388. Fedrigo, S.: La casa di Riposo Francesco e Teresa Vallardi. *Longevitá, 1:* 25-26, May-June 1952.

8389. MacPherson, A. W., and H. A. Himel: Views on the proper care of the aged and chronically ill. *Treatm. Serv. Bull., 7:* 210-214, 1952.

8390. Rancati, A.: L'inabilità e il suo domani. *Longevitá, 1:* 5-9, May-June 1952.

8391. Anonymous: Why not invest social security funds in housing? *Amer. City, 67:* 9, Aug. 1952.

See also Nos. 8250, 8423.

IX. Social Problems
(includes social adjustment)

8392. Beijer, G., and J. J. Oudegeest: *Some aspects of migration problems in the Netherlands.* Martinus Nijhoff, Hague, 1952, viii, 58 pp. Abstr: *P. I., 18:* No. 1109, 1952.

8393. Colcord, J. C.: *Your community; its provision for health, education, safety, and welfare.* Russell Sage Found., N. Y., 1947, 261 pp.

8394. Eliasberg, W.: Old people in the economics of a young country; psychiatric and sociological remarks. *Acta med. orient., 11:* 35-45, 1952.

8395. Gemelli, A., and M. Cesa-Bianchi: Disadattamento del vecchio alla vita individuale, familiare e sociale. *Riv. Geront. Geriat., 2:* 113-121, 1952.

8396. Golschmidt, A.: Social aspects of aging. *J. ment. Sci., 22:* 182-194, 1946.

8397. Pan, J-S.: A comparison of factors in the personal adjustment of old people in the protestant church homes for the aged and old people living outside of institutions. *J. soc. Psychol., 35:* 195-203, 1952.

8398. Seldon, A.: *The aged and the nation.* Liberal Publ. Dept., London, March 1948, 72 pp.

8399. Toulemon, A.: Influence du viellissement de la population sur la composition du corps electoral. *All. nat. Dépop., 1:* 107-115, 1948. Abstr: *P. I., 15:* No. 1, 1949.

See also No. 7832.

XI. Social Security

8400. Arce Reyeros, V.: Los seguros sociales deben prestar como beneficios aristencia médico-social; preventiva, curative, social y económica. *Med. contemp., 69:* 531-535, 1951.

8401. Berg, G.: (Pensions, an important question in current old age security.) *Svenska Läkartidn., 48:* 2844-2849, 1951.

8402. Carlotti, J. P.: La malaise de la sécurité sociale. *Rev. prat., Paris, 1:* 495-496, 1951.

8403. Cohen, W. J.: *Basic aims and objectives of social security in the United States.* Proc. Workshop Publ. Welf. Admin., Univ. Va., Charlottesville, 1951, pp. 10-25.

8404. Cohen, W. J.: *Recommendations to improve the Old-Age and Survivors Insurance provisions of the Social Security Act.* Conference on Labor, New York Univ. Proceed., 1949, pp. 291-314.

8405. Cohen, W. J.: *Strengthening weak spots in public and private pension plans.* In: T. C. Desmond (Chairman), Age Is No Barrier, N. Y. State Joint Legis. Commit. on Probl. of Aging, Legis. Doc. No. 35, 1952, pp. 105-108.

8406. Davidson, G. F.: Canada's new social security. *Survey, 88:* 168-171, 1952.

8407. de Schweinitz, K.: *People and process in social security.* Amer. Counc. on Educ., Washington, 1948, 165 pp.

8408. Levinson, M.: *The financing of social security.* City College Bus. Rev., N. Y., Fall 1949, 3 pp.

8409. Meriam, L.: *Relief and social security.* Brookings Inst., Washington, 1946, 912 pp.

8410. Myers, R. J., and E. A. Rasor: *Long-range cost estimates for expanded coverage and liberalized benefits proposed to the Old-Age and Survivors insurance system by H.R. 2893.* U. S. Soc. Sec. Adm., Div. of Actuary, Actuarial Study No. 28, Washington, 1949, 20 pp. Abstr: *P. I., 15:* No. 1440, 1949.

8411. Pate, W. W.: *The Social Security Act and the nonproductive age groups in the South.* U. S. Congress, Committee on Ways & Means, 1949, pp. 1979-1986.

8412. Ulman, R. (Editor): *Welfare state.* Bibliog. Univ. Debaters Annual, 1950-1951, pp. 155-190.

8413. U. S. Federal Security Agency. Social Security Administration: *Old-Age benefits; 1951.* Bur. Old-Age & Surv. Insur., Div. Prog. Anal., Anal. Note No. 68, June 20, 1952, pp. 1-6.

8414. U. S. Social Security Administration: *Social security status of the population. In:* Social Security Yearbook, 1947, U. S. Govt. Print. Off., Wash., 1949, pp. 2-6. Abstr: *P. I., 15:* No. 1452, 1949.

8415. Valingot, C.: Sciences sociales et sécurité sociale. *Concours méd., 74:* 703-706, 1952.

8416. Anonymous: Economic security for old age. *Canad. publ. Hlth. J., 43:* 90-92, 1952.

8417. Anonymous: Five nation agreement on old-age insurance. *Soc. Sec. Bull., 12:* 2, Dec. 1949.

8418. Anonymous: *Old-age security for farm people; a statement by the National Planning Association.* Nat. Plan. Ass., Agric. Committee, Washington, D. C., 1949, Report No. 22, 18 pp.

8431.

8432.

XII. Social Services and Social Work (recreation and rehabilitation)

8419. Bertarelli, E.: Vincere l'ozio a la noia dei vecchi. *Longevitá, 1:* 2, May-June 1952.

8420. Bohlin, G. S.: *Rehabilitation of older persons. In:* T. C. Desmond, (Chairman), Age Is No Barrier, N. Y. State Joint Legis. Commit. on Probl. of Aging, Legis. Doc. No. 35, 1952, pp. 97-100.

8433.

8434.

8421. Canger, M. R.: Their own center; older folks in Waco, Texas. *Recreation, 46:* 172-173, 1952.

8422. Council of Jewish Federations and Welfare Funds: *Yearbook of Jewish Social Services, 1952; an analysis of service and financial statistics for the year ending Dec. 31, 1951.* The Council, N. Y., 1952, 41 pp.

8435.

8436.

8423. Great Britain. National Old People's Welfare Committee: *Age is opportunity; a new guide to practical work for the welfare of old people.* Nat. Counc. Soc. Serv., Inc., London, March 1949, 118 pp.

8424. Great Britain. National Old People's Welfare Committee: *How you can help old people.* Nat. Counc. Soc. Serv., Inc., London, March 1950, Leaflet No. 1.

8437.

8438.

8425. Great Britain. National Old People's Welfare Committee: *The 1949 statement of work being carried out for old people by national and local voluntary organisations throughout the British Isles.* Nat. Counc. Soc. Serv., Inc., London, July 1949, 50 pp.

8439.

8426. Griswold, L. E. (Editor): *Handicraft; simplified procedure and projects.* Out West Print. & Stationary Co., Colorado Springs, 8th Edition, 1949, 512 pp.

8427. Kogel, M.: *The community prepares for its citizens' old age. In:* New York State (49th) Conference on Social Work. Papers, 1948, pp. 67-73.

8428. Rusk, H. A., J. F. Garrett, H. Viscardi, Jr., and E. J. Taylor: Employability of the chronically ill and disabled. *J. Amer. med. Ass., 149:* 595-597, 1952.

8429. Ruskowski, J. A.: *An institute for training community leaders.* In: T. C. Desmond (Chairman), Age Is No Barrier, N. Y. State Joint Legis. Commit. on Probl. of Aging, Legis. Doc. No. 35, 1952, pp. 52-59.

8430. Smigel, J. O.: Rehabilitation of the aged chronic invalid. *J. med. Soc., N. J., 49:* 143-146, 1952.

8431. Whillis, J.: Some aspects of rehabilitation. *Physiotherapy, 37:* 243-245, 1951.

8432. Anonymous: Illinois establishes new service for the aged. *Publ. Aid Ill., 19:* 7, June 1952.

See also Nos. 8252, 8274.

MISCELLANEOUS

8433. Crane, H. R., and E. W. McDaniel: An automatic counter for age determination by the C^{14} method. *Science, 116:* (3014), 342-347, 1952.

8434. Downes, J.: The longitudinal study of families as a method of research. *Milbank. mem. Fd. quart. Bull., 30:* 101-118, 1952. Abstr: *P. I., 18:* No. 1620, 1952.

8435. Holmes, A.: Das Alter der Erde, ein Kapitel geologischer Zeitrechnung. *Umschau, 50:* 585, 1950.

8436. Reichel-Dolmatoff, G.: Notas sobre la determinación del carbono 14 para constatar la edad de muestras animales o vegetales. *An. Soc. Biol., Bogotá, 5:* 18-20, 1952. Abstr: *B. A., 26:* No. 20533, 1952.

See also No. 7835.

IV. MISCELLANEOUS: *Popular Articles*

8437. Desmond, T. C.: Plight of the elderly. *Today's Hlth., 30:* 18-22, Aug. 1952.

8438. Desmond, T. C.: Those sunshine letters. *Coronet, 32:* 130-131, Aug. 1952.

8439. Dickinson, F. G.: Coming class war, old versus young; excerpt from Problems of America's Aging Population. *Harper's Mon. Mag., 205:* 81, July 1952.

8440. Gillilan, S.: On the spot. *Rotarian, 81:* 12, 1952.

8441. Gumpert, M.: *Our Inca ideas about retirement.* N. Y. Times Mag., p. 10-11, July 1952.

8442. Pearse, B.: What has John L. Lewis done with his $400,000,000? *Saturday Evening Post, 225:* 26-27, Aug. 1952.

8443. Randall, O. A.: Our problem oldsters. *Lifetime Living, 1:* 37, July 1952.

8444. Anonymous: Bigger pensions to be sought. *U. S. News, 33:* 69-71, Sept. 1952.

8445. Anonymous: Healthy elderly people. *Sci. News Lett. Wash., 62:* 116, Aug. 1952.

8446. Anonymous: Home care of aged promotes happiness. *Sci. News Lett., Wash., 62:* 73, Aug. 1952.

8447. Anonymous: Lives getting longer. *Sci. News Lett., Wash., 62:* 73, Aug. 1952.

8448. Anonymous: More social security? *Newsweek, 39:* 25, June 1952.

8449. Anonymous: Pensions for everybody (Chili). *Time, 60:* 51, Sept. 1952.

8450. Anonymous: Social security; going broke? *U. S. News, 33:* 22-23, Aug. 1952.

8451. Anonymous: We've been asked about bigger old age checks. *U. S. News, 32:* 62, June 1952.

8452. Anonymous: We've been asked how to get old age pensions. *U. S. News, 33:* 82, July 1952.

8453. Anonymous: What's next in pensions? *U. S. News, 33:* 52, Aug. 1952.